RCA VICTOR MODEL 15U

Fifteen-Tube, Five-Band, A-C Phonograph-Radio

TECHNICAL INFORMATION

Electrical Specifications

FREQUENCY RANGES

"Long Wave" (X)	150-410 kc
"Standard Broadcast" (A)	530-1,800 kc
"Medium Wave" (B)	1,800-6,400 kc
"Short Wave" (C)	6,400-23,000 kc
"Ultra Short Wave" (D)	23,000-60,000 kc

ALIGNMENT FREQUENCIES

"Long Wave" (X)	175 kc (osc.), 350 kc (osc., det., ant.)
"Standard Broadcast" (A)	600 kc (osc.), 1,500 kc (osc., det., ant.)
"Medium Wave" (B)	6,000 kc (osc., det., ant.)
"Short Wave" (C)	20,000 kc (osc., det., ant.)
"Ultra Short Wave" (D)	57,000 kc (osc., det., ant.)

Intermediate Frequency ..... 460 kc

RADIOTRON COMPLEMENT

(1)	RCA-6K7	R-F Amplifier	
(2)	RCA-6L7	First Detector	
(3)	RCA-6J7	Heterodyne Oscillator	
(4)	RCA-6K7	First I-F Amplifier	
(5)	RCA-6K7	Second I-F Amplifier	
(6)	RCA-6H6	Second Detector and A.V.C.	
(7)	RCA-6C5	Audio Voltage Amplifier	
(8)	RCA-6E5	"Magic Eye" Tuning Indicator	
(9)	RCA-6L7	Audio Volume Expander	
(10)	RCA-6C5	Audio Driver Amplifier	
(11)	RCA-6C5	Expander Amplifier	
(12)	RCA-6H6	Expander Rectifier	
(13)	RCA-2A3	Power Output	
(14)	RCA-2A3	Power Output	
(15)	RCA-5Z3	Full-Wave Rectifier	

Pilot Lamps (6) ..... Mazda No. 40, 6.3 volts, 0.15 ampere

POWER-SUPPLY RATINGS

		Radio Only	Total
Rating A-6	105-125 volts, 60 cycles	180 watts	205 watts
Rating A-5	105-125 volts, 50 cycles	180 watts	210 watts

For 220-volt operation, a step-down transformer (Stock No. 7217) must be used.

Fuse Rating ..... 3 amperes

PHONOGRAPH

Type	Automatic Record Ejector
Record Capacity	Seven 10-inch or Six 12-inch
Turntable Speed	78 R.P.M.
Type of Pickup	Low-Impedance Magnetic
Pickup Impedance	100 ohms at 1,000 cycles

POWER-OUTPUT RATINGS

Undistorted	12 watts
Maximum	15 watts

LOUDSPEAKER

Type	Super 12-inch Electrodynamic
Impedance (V.C.)	11¼ ohms at 400 cycles

Mechanical Specifications

CABINET DIMENSIONS

Height	34 inches
Width	48⅞ inches
Depth	18 11/16 inches

WEIGHTS

Net	222 pounds
Shipping	311 pounds

Chassis Base Dimensions	15 inches x 9¾ inches x 3 inches
Over-all Height of Chassis	9¼ inches
Amplifier Base Dimensions	16¼ inches x 7½ inches x 2¾ inches
Over-all Height of Amplifier	7⅝ inches

OPERATING CONTROLS

Radio	(1) Music-Speech—Power Switch, (2) Volume, (3) Tuning, (4) Range Selector (5) Fidelity
Phonograph	(1) Turntable Switch, (2) Radio-Phono Transfer Switch, (3) Index, (4) Dynamic Amplifier, (5) Phonograph Volume
Tuning Drive Ratios	20 to 1 and 100 to 1

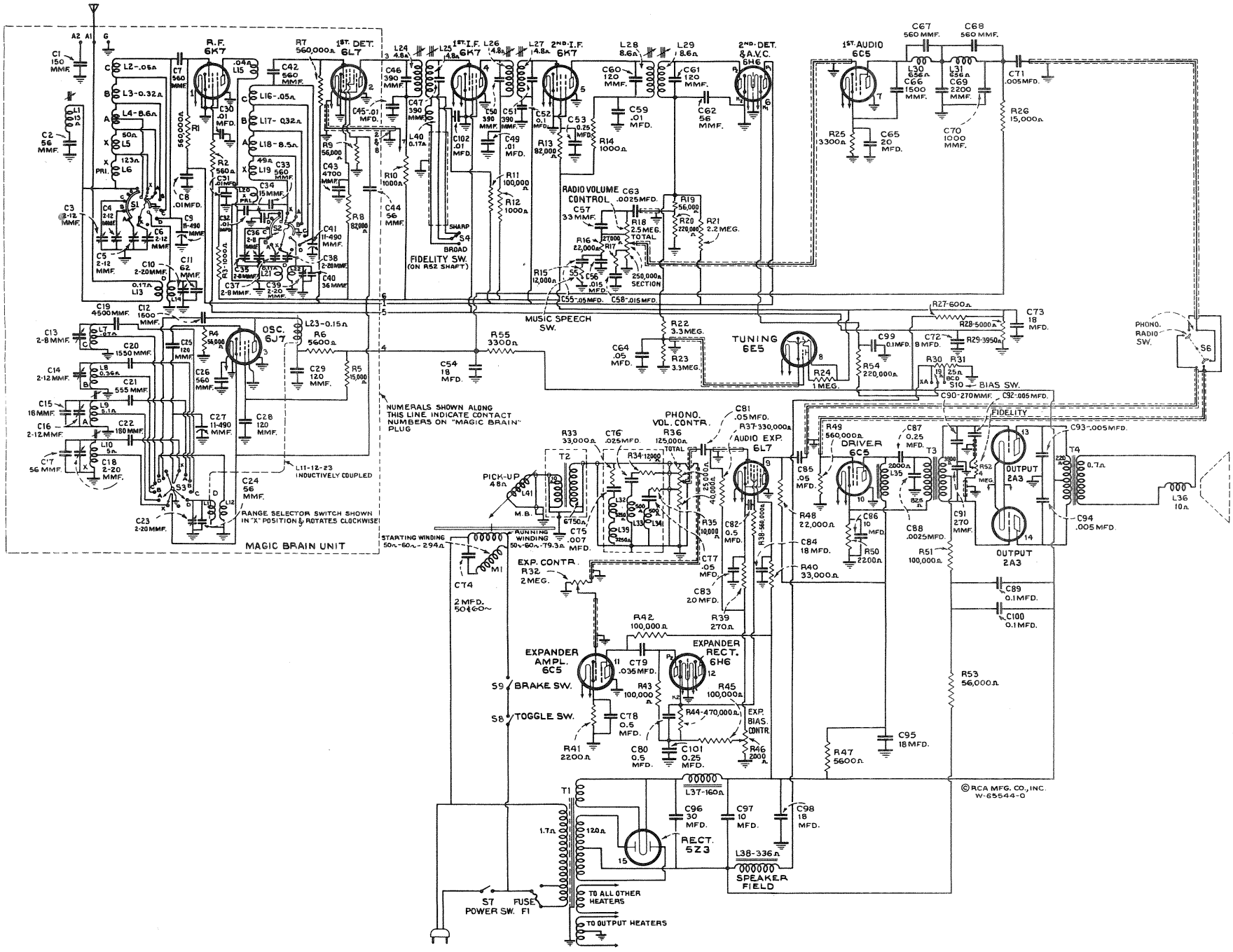


Figure 1—Schematic Circuit Diagram

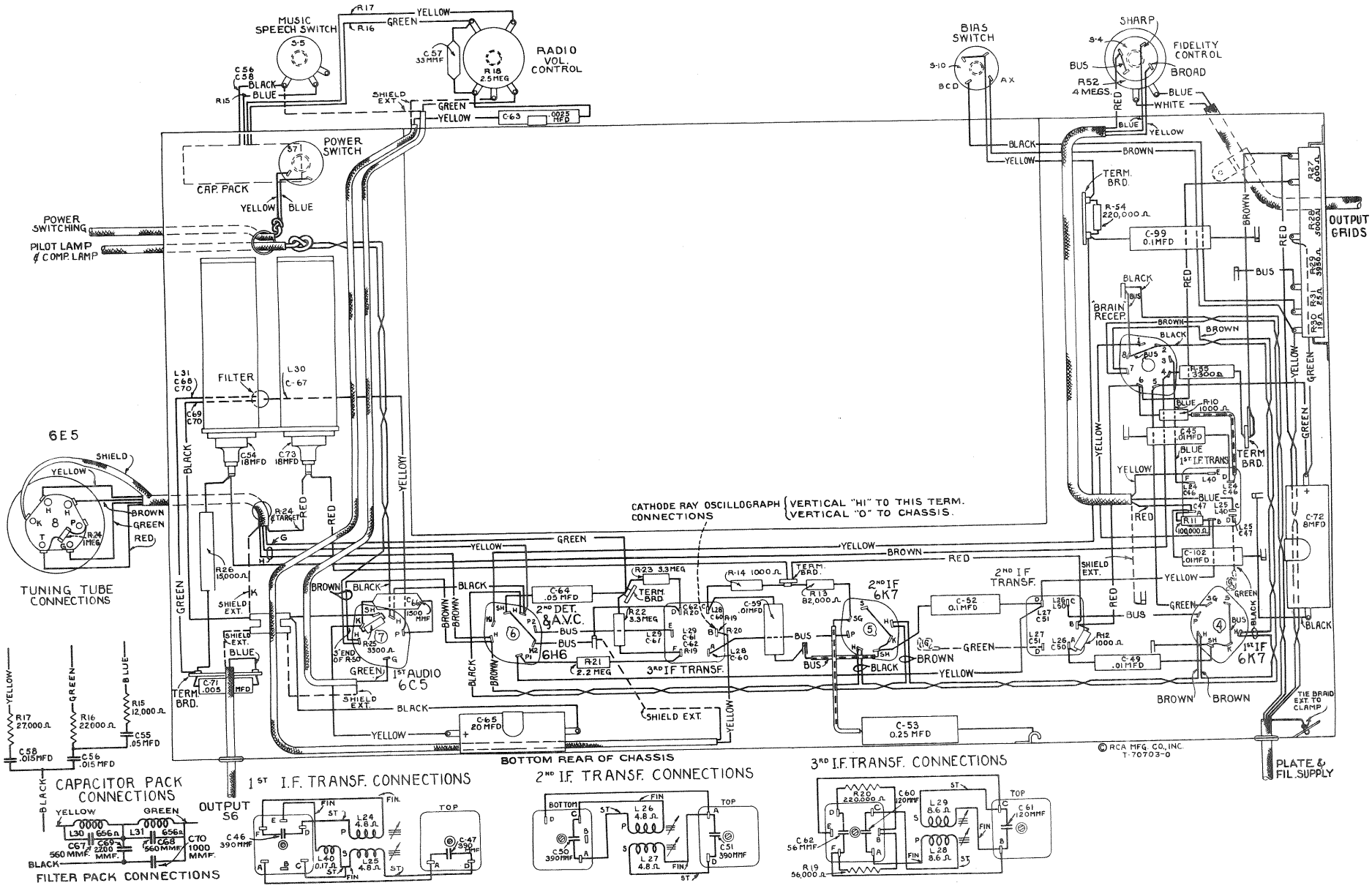


Figure 2—Receiver Chassis Wiring Diagram (Less "Magic Brain")

General Description

The Model 15U Phonograph-Radio Combination employs all of the latest developments in the art of record and radio reproduction. A few of the design features include higher-fidelity reproduction from both records and radio; the revolutionary dynamic expander; "Magic Brain"; improved automatic record changer; selector dial; "Magic Voice"; magnetite-core i-f transformers, wave-trap, and low-frequency oscillator tracking adjustments; new plunger-type air trimmers; and a super 12-inch electrodynamic loudspeaker with aluminum voice coil and high-frequency tone diffuser.

Circuit Arrangement

Phonograph

The voltage generated in the pickup L41 is applied across the phonograph volume control R36 through the pickup transformer T2 and the compensation pack. The arm of the volume control selects the amount of audio voltage applied to the control grid of the audio expander, RCA-6L7.

In order that full volume range reproduction may be realized from disc recordings, it is necessary that the gain of the audio expander be varied in direct proportion to the intensity of the recorded sound. To accomplish this, the expander control R32 is placed in shunt with the volume control, and the arm of the expander control connected to the control grid of the RCA-6C5 expander amplifier. The audio voltage applied to this tube is amplified and applied to diode plate No. P2 of the RCA-6H6 expander rectifier through capacitor C79. The rectified current develops a voltage across resistors R44 and R43. The voltage developed across R44 is applied to the No. 3 grid of the RCA-6L7 audio expander and varies the amplification of this tube so that the gain will be increased for loud passages and decreased for soft passages. The expander bias control R46 is used to adjust the residual bias on No. 3 grid of the audio expander.

The audio output of the RCA-6L7 audio expander is resistance-capacitance coupled to the audio driver RCA-6C5. The output of this tube is shunt fed to the primary of the interstage transformer T3 by means of reactance L5 and blocking capacitor C11. The audio signal developed across the secondary of T3 is applied to the control grids (push-pull) of the RCA-2A3 tubes for final power amplification. Bias for these tubes is developed across the loudspeaker field L38 and applied to the grids through resistance-capacitance filters. The output of the power-amplifier stage is transformer coupled to the voice coil of the electrodynamic loudspeaker.

Radio

The conventional type of superheterodyne circuit is used. It consists of an r-f amplifier stage, first-detector (converter) stage, separate oscillator stage, two i-f amplifier stages, a diode-detector—automatic-volume-control stage, an audio voltage amplifier stage, an audio driver stage, a push-pull power output stage, and a full-wave rectifier stage.

The new "Magic Brain" is constructed as a separate, self-contained, completely shielded, five-band, oscillator- detector- antenna-tuning unit which plugs into the main chassis.

The antenna couples to the RCA-6K7 r-f amplifier through a tuned antenna transformer. In the "Long wave" band, L6 acts as the primary while L5, L4, L3, and L2 act as the secondary. As bands are changed the sections of the coil are changed; the unused portions which resonate in the particular band in use are

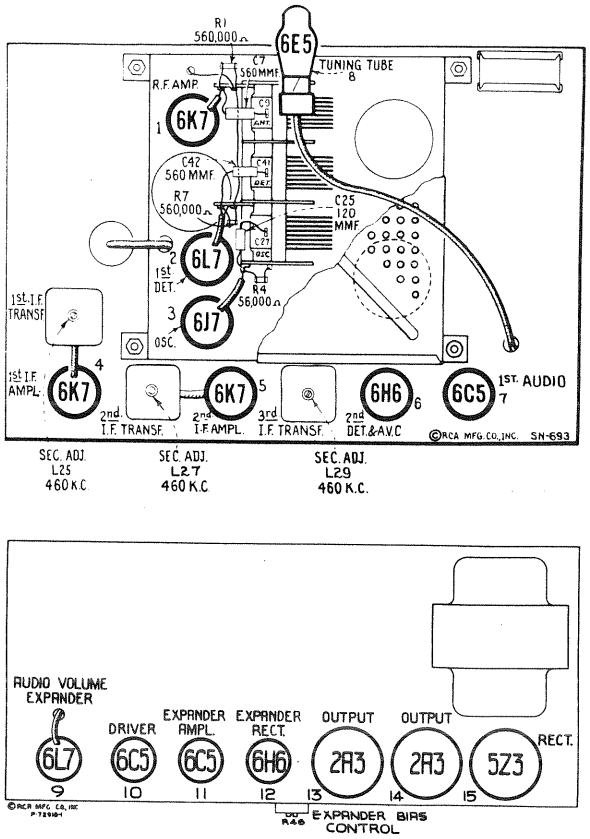


Figure 3—Radiotron and I-F Trimmer Locations

shorted out. This arrangement reduces the total number of coils and leads, and results in having a low-loss primary and secondary winding for each band with high efficiency of operation. The "Ultra short wave" band employs a separate antenna transformer, L13 and L14. The output of the r-f stage is fed to the first detector RCA-6L7 grid No. 1 through a similar r-f transformer. The locally generated (heterodyne) oscillator signal is applied to grid No. 3 of this same tube.

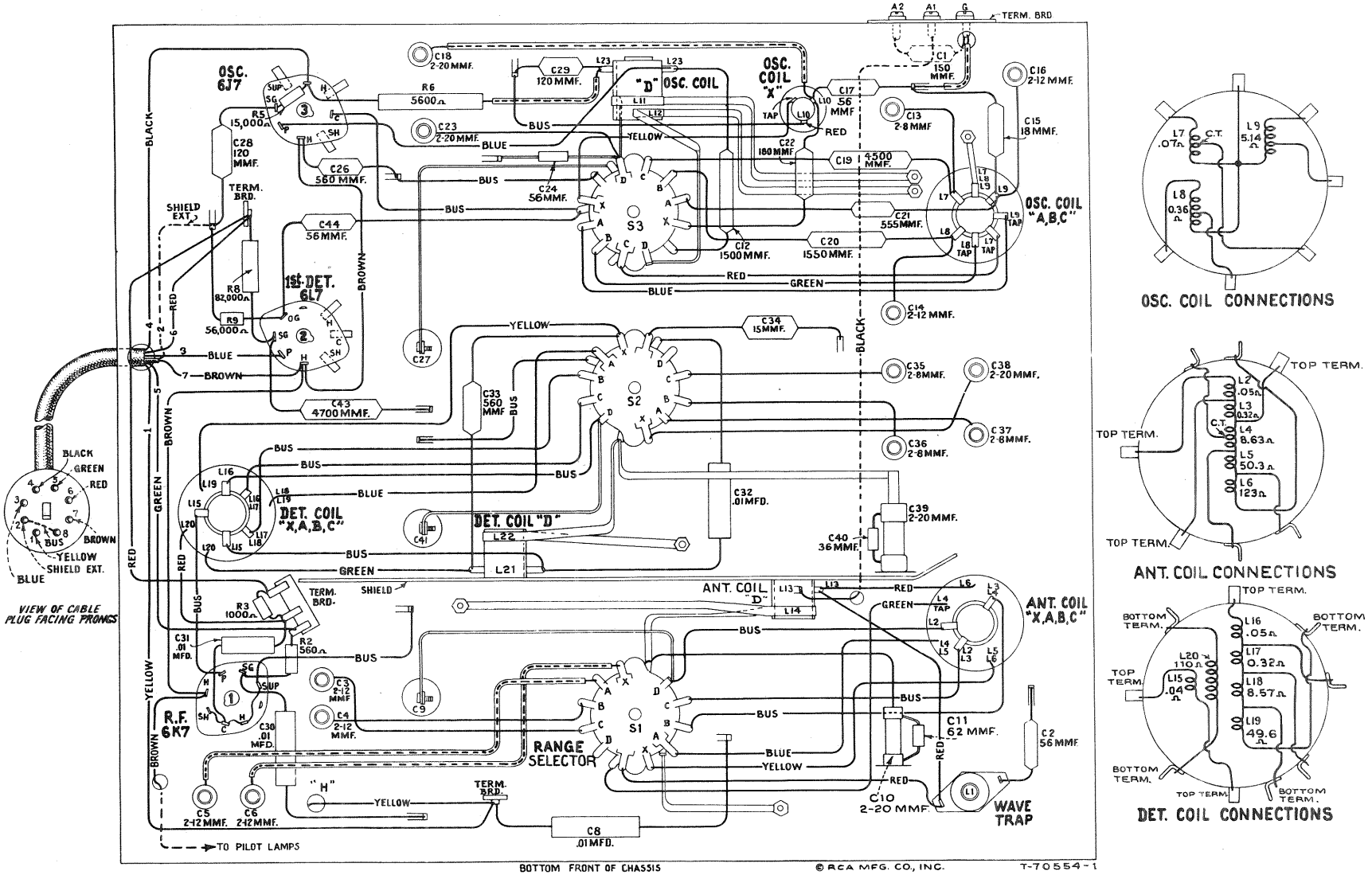


Figure 4—"Magic Brain" Wiring Diagram·

The output of the first detector is fed through the i-f amplifier consisting of two RCA-6K7 Radiotrons and three magnetite core i-f transformers. The first i-f transformer has a third (tertiary) winding L40 which, when placed in series with the secondary L25 by the fidelity switch S4, broadens the i-f amplifier characteristic curve for higher-fidelity reception. The output of the i-f amplifier is detected by the No. 2 diode of the RCA-6H6 twin-diode tube. The audio frequency secured by this process develops a voltage across resistor R20 which is applied across the radio volume control R18 through capacitor C63. The voltage which develops across resistors R19 and R20 is applied as automatic control grid bias to the r-f, first detector, and i-f tubes. The No. 1 diode of the RCA-6H6 is used to supply residual bias to the controlled tubes under conditions of little or no signal. This diode under such conditions draws current which flows through resistors R21, R19, and R20, thereby maintaining the desired operating bias. The sensitivity of the receiver is increased on the three high-frequency bands by reducing the residual bias on the above mentioned controlled tubes by switch S10 which is actuated by the range-selector control. The arm of the volume control R18 supplies audio signal voltage to the RCA-6C5 first-audio stage. The output of this stage is applied to the RCA-6C5 audio driver through a specially designed compensation filter network. The functions from this point on are the same as previously mentioned under "Phonograph" description.

The RCA-6E5 cathode-ray tuning tube provides a means of visually indicating when the receiver is accurately tuned to the incoming carrier. A portion of the signal voltage developed across resistors R19 and R20 is used to actuate the grid of the amplifier section of this tube. As the grid voltage increases negatively, the plate current is reduced and the indicating shadow becomes less. The correct point of tuning is indicated by the minimum width of the dark sector on the fluorescent screen.

Automatic Record Changer

An improved automatic mechanism, employing a synchronous motor, is used in these models. It is of the record ejector type, having a record capacity of seven for the ten-inch type, and a capacity of six for the twelve-inch type. The turntable speed is fixed at 78 r.p.m. by the design of the drive motor and the intermediate gear mechanism. *This speed is invariable and does not vary as long as the supply line frequency remains constant. It is very important that a machine of any particular rating be operated at the voltage and frequency for which it is designed and rated.* Attempts to operate on other voltages or frequencies will result in improper reproduction from the phonograph system and possible damage to the equipment. The ejecting mechanism is arranged so that it will trip on various types of records. This is obtained by having a trip mechanism which is actuated by the rate of needle acceleration toward the center of the record.

"Magic Voice"

This instrument is designed with a cabinet incorporating the "Magic Voice." This is accomplished by having the rear of the speaker compartment completely enclosed by a tight-fitting back.

Five metal open-end pipes of equal diameter but of three different lengths are inserted in holes in the cabinet base and extend upward in the speaker compartment. The effect is to cause the lower-frequency waves, reaching the front of the cabinet through the pipes, to arrive approximately in-phase with the sound waves emitted from the front of the speaker, giving extended low-frequency response without boominess, or cabinet resonance.

SERVICE DATA

The various diagrams in this booklet contain such information as will be needed to locate causes for defective operation if such develops. The values of the various resistors, capacitors, coils, etc., are indicated adjacent to the symbols signifying these parts on the diagram. Identification titles, such as C1, L2, R1, etc., are provided for reference between the illustrations and the Replacement Parts List. The coils, reactors, and transformer windings are rated in terms of their d-c resistance only. Resistance values of less than one ohm are generally omitted.

Alignment Procedure

There are seventeen adjustments required for the alignment of the oscillator, first-detector, and antenna-tuned circuits; one adjustment for the wave-trap; and six adjustments for the i-f system. Fifteen of these adjustments are made with plunger-type air trimming capacitors and require the use of an **RCA Stock No. 12636 Adjusting Tool.** Each of these capacitors has a lock nut for securing the plunger in place after adjustment. The remaining nine adjustments are made by means of screws attached to molded magnetite cores. These cores change the inductance of the particular coils in which they are inserted to provide exact alignment. All of these adjustments are accurately made during manufacture and should remain in proper alignment unless affected by abnormal conditions of climate or purported alterations for servicing, or unless altered by other means. Loss of sensitivity, improper tone quality, and poor selectivity are the usual indications of improper alignment. Such conditions will usually exist simultaneously. Correct performance of this receiver can only be obtained when these adjustments have been made by a skilled service engineer with the use of adequate and reliable test equipment. The manufacturer of this receiver has such test equipment available for sale through its distributors and dealers.

The extensive frequency range of these receivers necessitates a more or less involved method of align-

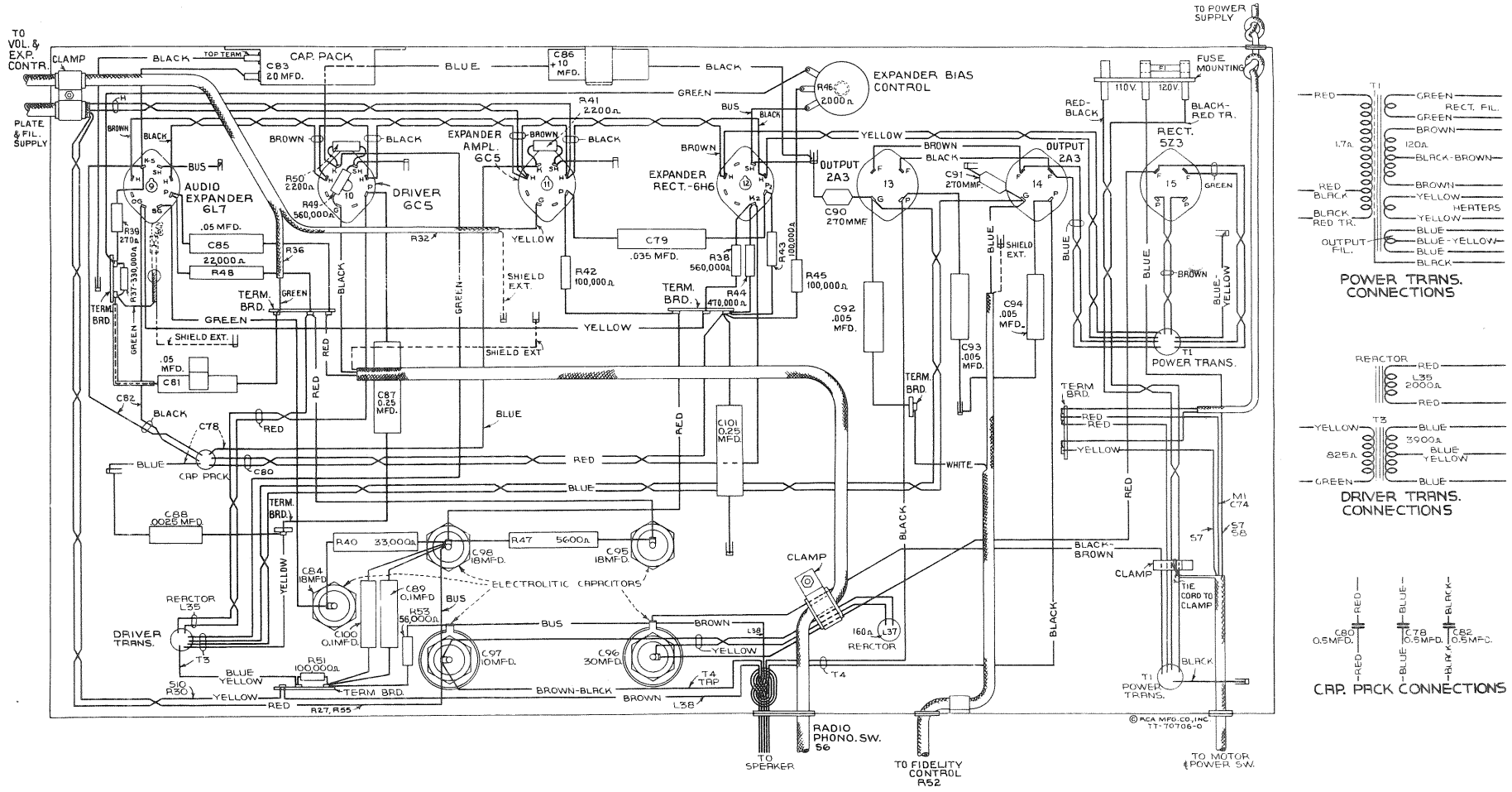


Figure 5—Power Amplifier Wiring Diagram

ment. However, if the following directions are carefully applied in the sequence given, normal performance of the instruments will be obtained.

The plunger-type air trimming capacitors have their approximate plunger settings tabulated on figure 8. If the plungers have been disturbed from their original adjustments, they may be roughly set to the specified dimensions prior to alignment.

In performing services on the "Magic Brain", the leads should be restored to their original positions, since the lead-dress is important for proper operation and dial calibration.

Precautionary Dressing of Leads for "Magic Brain" Alignment
(Refer to Figure 4)

Band "X"

1. Keep blue lead A of S1 to antenna coil L4-5 dressed away from chassis, and from yellow lead X of S1 to antenna coil L5-6.
2. Bus lead from C10 to S1 should be as short as possible.
3. Keep blue lead A of S2 to detector coil L18-19 clear of chassis, coil shield, coil, and other leads.
4. Keep spaghetti lead C6 to X of S1 apart from spaghetti lead C5 to A of S1, and from chassis.

Band "A"

1. Keep green lead terminal S1 to antenna coil tap L4 away from chassis, coil shield, and coil.
2. Keep spaghetti lead C5 to A of S1 apart from spaghetti lead C6 to X of S1 and from chassis.

Band "C"

Lead from C19 to oscillator coil L7 should be maintained as short and straight as possible.

For alignment, the test-oscillator frequency should be quite accurate. A convenient and reliable means of accurately checking the frequency of test oscillators, receivers, etc., is the **RCA Stock No. 9572 Crystal Calibrator.**

If the test-oscillator signal cannot be heard as the receiver (heterodyne) oscillator air-trimmer plunger is changed from its minimum-capacity to maximum-capacity position (receiver dial and test oscillator set to the specified frequencies, and the correct oscillator air-trimmer used) it may be an indication that the test-oscillator frequency is outside the range covered by the air-trimmer. Under such conditions, when a more accurate setting of the test oscillator cannot be determined, set the oscillator air-trimmer plungers to the approximate settings given on figure 8. Tune the test oscillator until the signal is heard in the speaker. Each of two test-oscillator settings (the fundamentals or the harmonics of which are 920 kc apart) produce a signal. The lower-frequency test-oscillator setting should be used as this places the test-oscillator (signal) frequency 460 kc below the frequency of the receiver heterodyne oscillator.

Holes are provided in the top of the r-f and antenna coil cans on some models to enable a tuning check with the **RCA Stock No. 6679 Tuning Wand.** The hole in the top of the detector coil can has a cinch button which must be removed before insertion of the tuning wand. When the brass end of the wand is inserted in the coil, the inductance of the coil is decreased. If this results in an increase of output, the respective air-trimmer capacitance should be decreased (plunger pulled out). If inserting the iron end of the tuning wand causes an increase in output, resulting from an increase of inductance of the coil, the respective air-trimmer capacitance should be increased (plunger pushed in). If the range of the air trimmer is not sufficient to give the desired results, the lead-dress may be changed in the particular circuit being aligned, so as to cause the circuit to resonate within the range of the trimmer. An increase in the capacity-to-ground of the circuit will be required if the iron end of the tuning wand causes an increase of signal output when the air-trimmer plunger is full-in, while a decrease in the capacity-to-ground will be required if the brass end of the tuning wand causes an increase in signal output when the air-trimmer plunger is full-out.

Two methods of alignment are applicable—one requires use of the cathode-ray oscillograph, and the other requires a voltmeter or glow-type indicator. The cathode-ray alignment method is advantageous

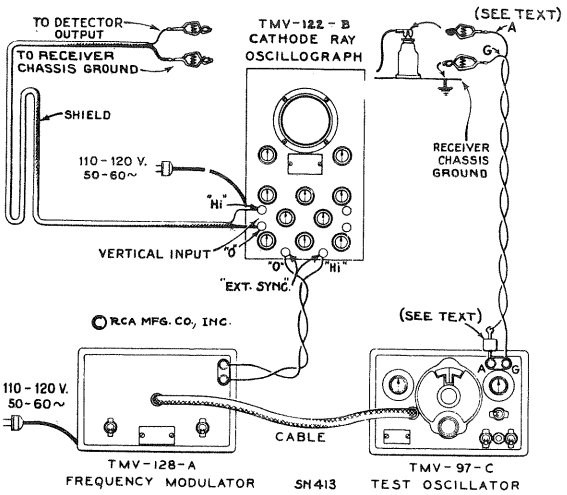


Figure 6—Alignment Apparatus Connections

in that the indication provided is in the form of a wave-image which represents the resonance characteristics of the circuit being tuned. This method is preferred because of the i-f characteristics of these receivers. This type of alignment is possible through use of apparatus such as the **RCA Stock No. 9558 Frequency Modulator** and the **RCA Stock No. 9545 Cathode-Ray Oscillograph.** If this equipment is not available, an approximate alignment may be performed by the output-indicator method with an instrument such as the **RCA Stock No. 4317 Neon Glow Indicator** attached across the loudspeaker voice coil. Alignment by this method is similar to the cathode-ray method outlined below except that the receiver volume control should be at maximum, the trimmers adjusted to peak response and the test-oscillator sweeping operations omitted. Either of these methods require the use of a reliable test oscillator such as the **RCA Stock No. 9595.**

Cathode-Ray Alignment

Make alignment apparatus connections shown on figure 6. Remove the plug of the frequency-modulator

cable from the test-oscillator jack. Connect the receiver chassis to a good external ground. Connect oscillograph "Vertical" input terminals as indicated on figure 2. Set oscillograph power switch to "On" and adjust "Intensity" and "Focus" controls to give a clearly defined spot, or line, on the screen. Set oscillograph "Ampl. A" switch to "On," "Vertical gain" control full-clockwise, "Ampl. B" switch to "Timing," "Range" switch to No. 2 position, and "Timing" switch to "Int." Place the "Sync." control, "Freq." control, and "Horizontal gain" control to about their mid-positions. For each of the following adjustments, the test-oscillator output must be regulated so that the image obtained on the oscillograph screen will be of the minimum size for accurate observation. The receiver volume-control setting is optional.

I-F Adjustments

(a) Set "Fidelity" control to counter-clockwise position, "Radio-Phono" switch to "Radio," and "Range Selector" to "Standard Broadcast" band. Connect the "Ant." output of the test oscillator to the grid cap of RCA-6K7 second i-f tube (with grid lead in place) through a **.001-mfd.** capacitor, with "Gnd." to receiver chassis. Tune the test oscillator to **460 kc** and place its modulation switch to "On" and its output switch to "Hi."

(b) Turn on the receiver and test oscillator. Increase the output of the test oscillator until a deflection is noticeable on the oscillograph screen. The figures obtained represent several waves of the detected signal, the amplitude of which may be observed as an indication of output. Cause the wave-image formed (400-cycle waves) to be spread completely across the screen by adjusting the "Horizontal gain" control. The image should be synchronized and made to remain motionless by adjusting the "Sync." and "Freq." controls.

(c) Adjust the two magnetite core screws **L29** and **L28** (see figures 3 and 11) of the third i-f transformer (one on top and one on bottom) to produce maximum vertical deflection of the oscillographic image. This adjustment places the transformer in exact resonance with the **460-kc** signal.

(d) The sweeping operation should follow using the frequency modulator. Shift the oscillograph "Timing" switch to "Ext." Insert plug of frequency-modulator cable in test-oscillator jack. Turn the test-oscillator modulation switch to "Off." Turn on the frequency modulator and place its sweep-range switch to "Hi."

(e) Increase the frequency of the test oscillator by slowly turning its tuning control until two separate, distinct, and similar waves appear on the screen. If only one wave appears, increase the "Freq." control on the oscillograph to obtain two waves. These waves will be identical in shape, totally disconnected, and appear in reversed positions. They will have a common base line, which is discontinuous. Adjust the "Freq" and "Sync." controls of the oscillograph to make them remain motionless on the screen. Continue increasing the test-oscillator frequency until these forward and reverse curves move together and overlap, with their highest points exactly coincident. This condition will be obtained at a test-oscillator setting of **approximately 575 kc.**

(f) With the images established as in (e), re-adjust the two magnetite core screws **L29** and **L28** on the third i-f transformer so that they cause the curves on the oscillograph screen to become exactly coincident throughout their lengths and have maximum amplitude.

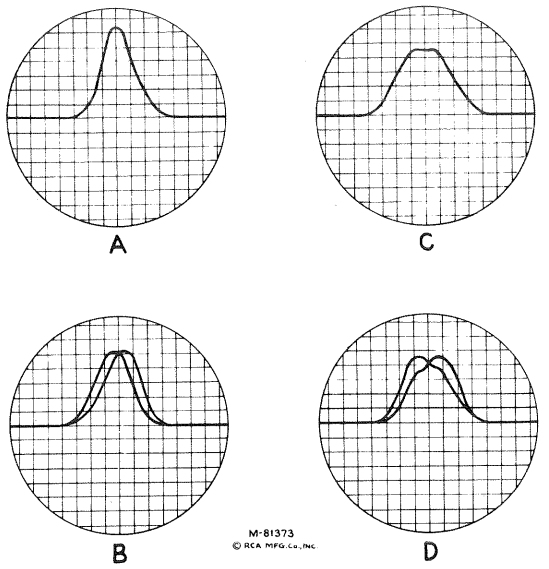


Figure 7—I-F Alignment Oscillograph Curves

A—**Correct** curve showing proper i-f alignment as obtained with fidelity control counter-clockwise.

B—**Incorrect** curve similar to A showing improper alignment of i-f system caused by one or more circuits being slightly detuned.

C—**Correct** showing broadening of curve A obtained when fidelity control is rotated fully clockwise.

D—**Incorrect** curve showing broadening of curve B obtained when fidelity control is rotated fully clockwise.

(g) Without altering the adjustments of the apparatus, shift the "Ant." output of the test oscillator to the grid cap of the RCA-6K7 first i-f tube (with grid lead in place), through a **.001-mfd.** capacitor. Regulate the test-oscillator output so that the amplitude of the oscillographic image is approximately the same as used for adjustment (f) above.

(h) The two second i-f transformer magnetite core screws **L27** and **L26** (one on top and one on bottom) should then be adjusted so that they cause the forward and reverse curves to become coincident throughout their lengths and have maximum amplitude.

(i) Without altering the adjustments of the apparatus, shift the "Ant." output of the test oscillator to the input of the i-f system, i.e., to the grid cap of the RCA-6L7 first-detector, (with grid lead in place) through a **.001-mfd.** capacitor. Regulate the test-oscillator output so the amplitude of the oscillographic image is approximately the same as used for adjustment (h) above.

(j) The two first i-f transformer magnetite core screws **L25** and **L24** (one on top and one on bottom) should then be adjusted so that they cause the forward and reverse waves to become coincident throughout their lengths and have maximum amplitude.

(k) Note width of oscillographic image at a point which is 50% of maximum amplitude. Turn receiver fidelity control to extreme clockwise position. Note width of oscillographic image at a point which is 50% of maximum amplitude. Under normal conditions the latter measurement should be approximately 60% greater in width than the former measurement. The image should also appear slightly double humped. These conditions indicate proper broadening of the band width of the i-f amplifier. Turn range selector to "Medium wave" (B) band and note increase of amplitude. The amplitude should increase several times. It may be necessary to decrease output of test oscillator to keep image on screen. Turn receiver fidelity control to extreme counter-clockwise position and proceed to "R-F Adjustments."

R-F Adjustments

Make receiver dial adjustments as outlined by "Selector dial," figure 14. Alignment must be made in sequence of "Wave-trap," "Ultra short wave" band, "Short wave" band, "Medium wave" band, "Standard broadcast" band, and "Long wave" band.

"Wave-Trap" Adjustment

(a) Connect the "Ant." output of the test oscillator to the antenna terminal "A1" through a **200-mmfd. (important)** capacitor. Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn test-oscillator modulation switch to "On." Shift the oscillograph "Timing" switch to "Int." Place receiver range selector in "Standard broadcast" position. Set the receiver dial to a position of no extraneous signals **near 600 kc.** Tune the test oscillator to **460 kc.** Adjust the wave-trap magnetite core screw **L1** to the point which causes minimum amplitude of output (maximum suppression of signal) as shown by the waves on the oscillograph. An increase of the test-oscillator output may be necessary before this point of minimum amplitude, obtained by correct adjustment of wave-trap screw, becomes apparent on oscillograph screen.

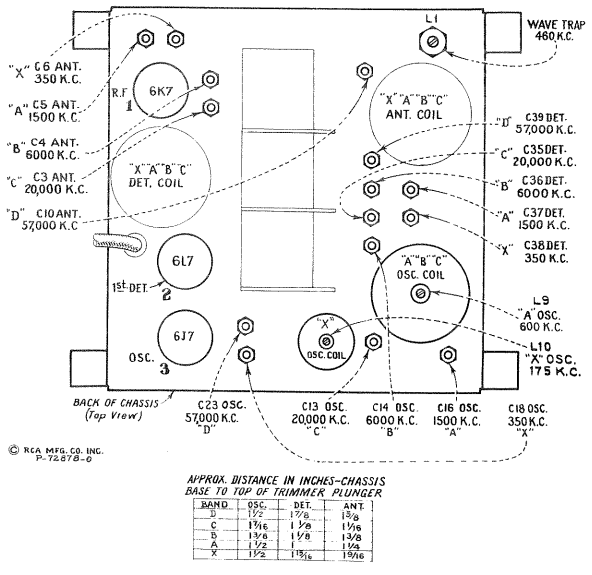


Figure 8—"Magic Brain" Trimmer Locations

"Ultra Short Wave" Band

(b) Connect the "Ant." output of the test oscillator to the antenna terminal "A1" of the receiver through a **300-ohm** resistor. Set the receiver range selector to its "Ultra short wave" position and its dial pointer to **57,000 kc.** Adjust the test oscillator to **19,000 kc.** The third harmonic of **19,000 kc** is used for this adjustment.

Adjust oscillator air-trimmer **C23** for maximum (peak) output. Two positions, each producing maximum output, may be found. The position of minimum capacitance (plunger near out) should be used. This places the receiver heterodyne oscillator **460 kc** higher in frequency than the incoming signal. Tighten lock nut. Adjust the detector air-trimmer **C39,** while slightly rocking the gang tuning condenser back and forth through the signal, for maximum (peak) output. Two peaks may be found on this trimmer. The peak of maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust the antenna air-trimmer **C10** for maximum (peak) output while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found on this trimmer which produce maximum output. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Check the image frequency by changing the receiver dial setting to **56,080 kc.** If the image signal is received at this position, the adjustment of the oscillator air-trimmer **C23** has been correctly made. No adjustments should be made while checking for the image signal.

(c) Re-tune receiver for maximum response to **57,000 kc** (not image response) without disturbing test-oscillator adjustments. Change test oscillator to **6,800—14,000 kc** range. Tune test oscillator until signal is heard in speaker (should occur at approximately **14,250 kc,** fourth harmonic of test oscillator used). Two test-oscillator settings **(230 kc** apart) will produce a signal at this point. The lower frequency test-oscillator setting should be used, as this places the test oscillator harmonic **460 kc** below the frequency of the receiver heterodyne oscillator. Tune receiver for

maximum response at a dial setting of approximately 28,500 kc (image should tune in at a dial setting approximately 27,580 kc) without altering test-oscillator adjustment. Test-oscillator second harmonic of 14,250 kc is used for the following check. Check calibration of receiver dial. A receiver-dial reading of less than 28,500 kc indicates that the inductance of the oscillator secondary coil L11 is too low and should be increased. If the receiver dial reading is greater than 28,500 kc, the inductance of L11 is too high and should be decreased. If it is necessary to change the inductance of L11, first remove bottom cover of "Magic Brain" and then set receiver dial pointer to 28,500 kc. To decrease inductance, move the grounded ends (straps) of L11 and L12 (see figure 4) nearer chassis. Do not allow straps to touch chassis except where connected. To increase inductance, move the straps farther away from chassis. Adjust position of straps until maximum (peak) output results. The alignment of the detector tuned circuit should next be checked at 28,500 kc without changing either the receiver or test oscillator adjustments. An increase of output when the brass end of a tuning wand is brought near L22 indicates that L22 is too high in inductance, while an increase when the iron end is brought near the coil indicates that the inductance is too low. The inductance of L22 may be varied by changing the spacing between the grounded end (strap) of L22 and the strap connected from C41 to contact on S2 (figure 4). An increase of spacing will increase the inductance, while a decrease of spacing will decrease the inductance. Adjust the spacing until maximum (peak) output results. Replace "Magic Brain" bottom cover and repeat adjustments in (b) prior to those of "Short wave" band.

"Short Wave" Band

(d) Set the receiver range selector to its "Short wave" position and its dial pointer to 20,000 kc. Adjust the test oscillator to 20,000 kc. Adjust oscillator air-trimmer C13 until maximum (peak) output is reached. Two peaks may be found with this circuit. The peak with minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust detector air-trimmer C35 until maximum (peak) output is reached, while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust antenna air-trimmer C3 until maximum (peak) output is reached while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Check the image frequency by changing the receiver dial setting to 19,080 kc. The image signal should be received at this position indicating that the adjustment of C13 has been correctly made. No adjustments should be made while checking for the image signal.

"Medium Wave" Band

(e) Place receiver range selector to its "Medium wave" position with its dial pointer set to 6,000 kc. Tune the test oscillator to 6,000 kc. Adjust oscillator air-trimmer C14 to produce maximum (peak) output as shown by the waves on the oscillograph. Two peaks may be found with this circuit. The peak with minimum capacitance (plunger near out) should be used. Tighten lock nut. Adjust the detector air-trimmer C36 for maximum (peak) output while slightly rocking the gang tuning condenser back and forth through the signal. Two peaks may be found with this circuit. The peak with maximum capacitance (plunger near in) should be used. Tighten lock nut. Adjust antenna air-trimmer C4 to produce maximum (peak) output. Tighten lock nut.

"Standard Broadcast" Band

(f) Remove the 300-ohm resistor from between the test-oscillator "Ant." post and receiver antenna terminal "A1" and insert a 200-mmfd. capacitor in its place. Place receiver range selector to "Standard broadcast" position with receiver dial pointer set to 600 kc. Tune the test oscillator to 600 kc. Adjust oscillator magnetite core screw L9 (top of large oscillator coil can) for maximum (peak) output as shown by the waves on the oscillograph screen.

(g) Set receiver dial pointer to 1,500 kc. Tune test oscillator to 1,500 kc (1,500–3,100-kc range) and increase its output to produce a registration on the oscillograph screen. Carefully adjust the oscillator, detector, and antenna air-trimmers C16, C37, and C5, respectively, to produce maximum (peak) output as shown by the waves on the oscillograph screen. Shift the oscillograph "Timing" switch to "Ext." Place the frequency modulator sweep-range switch to its "Lo" position and insert plug of the frequency-modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (increase frequency) until the forward and reverse waves show on the oscillograph screen and become coincident at their highest points. This will occur at a test-oscillator setting of approximately 1,680 kc. Adjust trimmers C16, C37, and C5 again, setting each to the point which produces the best coincidence and maximum amplitude of the images.

(h) Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn test-oscillator modulation switch to "On." Set oscillograph "Timing" switch to "Int." Tune test oscillator to 200 kc (200–400-kc range). Tune receiver for maximum response to this signal at a dial reading of approximately 600 kc. The third harmonic of the 200-kc signal is used for this adjustment Shift oscillograph "Timing" switch to "Ext." Insert the plug of the frequency

modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (increased frequency) until the forward and reverse waves show on the oscillograph screen. This will occur at a test-oscillator setting of **approximately 230 kc.** Disregarding the fact that the two images may or may not come together, adjust the oscillator magnetite core screw **L9** (top of large oscillator coil can) to produce maximum (peak) amplitude of the images. Shift the oscillograph "Timing" switch to "Int." Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn the test-oscillator modulation switch to "On." Repeat adjustments in (g) above to compensate for any changes caused by the adjustment of **L9** core, tightening lock nuts on **C16, C37,** and **C5,** respectively, after each is adjusted.

"Long Wave" Band

(i) Shift the oscillograph "Timing" switch to "Int." Remove the plug of the frequency-modulator cable from the test-oscillator jack. Turn the test-oscillator modulation switch to "On." Place receiver range selector to its "Long wave" position. Set the receiver dial pointer to **175 kc.** Tune the test oscillator to **175 kc** and increase its output until a deflection is noticeable on the oscillograph screen. Adjust oscillator magnetite core screw **L10** (located on top of small oscillator coil can) so that maximum (peak) amplitude of output is shown on the oscillograph screen.

(j) Set receiver dial pointer to **350 kc.** Tune test oscillator to **350 kc.** Adjust the oscillator, detector, and antenna air-trimmers **C18, C38,** and **C6** to produce maximum (peak) output as shown by the waves on the oscillograph screen. Without disturbing the connections, shift the oscillograph "Timing" switch to "Ext." Place the frequency-modulator sweep-range switch to its "Hi" position and insert plug of frequency-modulator cable in test-oscillator jack. Turn test-oscillator modulation switch to "Off." Re-tune the test oscillator (decrease frequency) until the forward and reverse waves show on the oscillograph screen and become coincident at their highest points. This will occur at a test-oscillator setting of **approximately 198 kc.** This setting places the test-oscillator frequency to **175 kc.** The second harmonic is now used for the **350 kc** adjustment. Adjust air-trimmers **C18, C38,** and **C6,** again, to produce maximum amplitude of the images and best coincident throughout their lengths.

(k) Re-tune the receiver to **approximately 175 kc** so that the forward and reverse waves appear on the oscillograph screen. Adjust the oscillator magnetite core screw **L10** to produce maximum (peak) amplitude of the waves, disregarding the fact that the two images may or may not come together.

(l) Shift the receiver dial setting to **350 kc** without altering any other adjustments (frequency modulator still in operation). Adjust air-trimmers **C18, C38,** and **C6,** respectively, to produce maximum amplitude and best coincidence of the waves. These adjustments compensate for any changes caused by the adjustment of the magnetite core screw **L10.** Tighten lock nuts on **C18, C38,** and **C6,** respectively, after each is adjusted.

Radiotron Cathode Current Readings

Measured with Milliammeter Connected at Tube Socket Cathode Terminal under Conditions Similar to Those of Voltage Measurements

(1)	RCA-6K7—R-F Amp.....	5.0 ma.
(2)	RCA-6L7—1st Det.....	3.7 ma.
(3)	RCA-6J7—Osc.	7.0 ma.
(4)	RCA-6K7—1st I-F Amp.....	5.0 ma.
(5)	RCA-6K7—2nd I-F Amp.....	7.5 ma.
(6)	RCA-6H6—2nd Det.—A.V.C..	—
(7)	RCA-6C5—Audio Voltage Amp.	2.5 ma.
(8)	RCA-6E5—Tuning Tube.....	1.2 ma.
(9)	RCA-6L7—Audio Volume Exp.	7.5 ma.
(10)	RCA-6C5—Audio Driver.....	4.0 ma.
(11)	RCA-6C5—Expander Amplifier.	1.9 ma.
(12)	RCA-6H6—Expander Rectifier..	—
(13)	RCA-2A3—Power Output.....	41.8 ma.
(14)	RCA-2A3—Power Output.....	41.8 ma.
(15)	RCA-5Z3—Rectifier	165 ma.*

(*Cannot be measured at socket)

Dynamic Amplifier Adjustments

It is essential that correct voltages and currents exist at the RCA-6L7 audio expander stage in order that the expanding function may take place in the proper manner. A screw-driver adjustment is accordingly provided to regulate the RCA-6L7 control grid No. 3 bias to the correct operating value. Two methods of adjustment are applicable. Either method requires a normal voltage of 300 volts across the filter output. The one to be preferred (a) requires the use of an **RCA Stock No. 9633 Beat-Frequency Oscillator** or the equivalent, a 100-ohm resistor, a 200-ohm resistor, and a 1,000-ohm-per-volt a-c voltmeter (rectifier-type) having a "low" range of 1.0 volt and a "high" range of 250 volts or greater. The less accurate method (b) requires the use of an **RCA Stock No. 12353 Split-Plate Adapter,** and a suitable d-c milliammeter. Both of these procedures are outlined below. **CAUTION: Before using either method, be sure that power-supply fuse is in proper position for the line voltage.**

(a) Preferred Method

Turn power switch off. Connect the 200-ohm and the 100-ohm resistors in series between the beat-frequency oscillator terminals (upper "250" and "CT") with the 100-ohm resistor connected to "CT." Calibrate the beat-frequency oscillator, adjust it to 1,000 cycles, and reduce its output. Connect the 1,000-ohm-per-volt a-c voltmeter (1-volt range) to the beat-frequency oscillator terminals (upper "250" and "CT"). Remove the male plug from the receptacle on the shielded cable running between the input transformer T2 and the compensator pack (see figure 12). Connect beat-frequency oscillator terminal "CT" to the large

pin on the male plug. Connect the junction of the 200-ohm and the 100-ohm resistors to the small pin on the male plug.

Adjust beat-frequency oscillator output until the voltmeter reads exactly 1.0 volt. Remove the voltmeter leads from beat-frequency oscillator terminals without disturbing any of the oscillator adjustments. Place the voltmeter to its 250-volt or greater range and connect it between the plate prongs of the two RCA-2A3 power-output tubes. Connections to the tube prongs may be made by stripping approximately ½ inch of insulation from the ends of two short leads of rubber-covered wire, wrapping one bare end around each plate prong (being careful not to allow the bare ends to short on the chassis when the tubes are placed in their sockets), and connecting the voltmeter to these leads. **CAUTION: Do not touch these plate connections after the power is turned on since the potential at these points is rather high and carelessness might result in a serious shock.**

Set the "Dynamic amplifier" and "Fidelity control" to their extreme counter-clockwise positions. Set the "Phonograph volume" control to its extreme clockwise position. Turn on power switch and allow a few minutes for the instrument to become stabilized. Adjust the expander-bias control R46, on rear apron of amplifier (see figure 3), until the voltmeter reads 195 volts. Turn "Phonograph volume" control to extreme counter-clockwise position. Transfer lead from the junction of the 200-ohm and the 100-ohm resistors to the beat-frequency oscillator (upper "250") terminal without disturbing any of the oscillator adjustments. Adjust "Phonograph volume" control until the voltmeter reads 50 volts. Turn the "Dynamic amplifier" control to its extreme clockwise position allowing maximum expansion to take place. The voltmeter should now read not less than 150 volts if the expander circuit is operating correctly. Failure to do so indicates a defect in the system and the usual service procedure should be followed.

(b) **Alternate Method**

Turn power switch off. Place **RCA Stock No. 12353 Split-Plate Adapter** under the RCA-6L7 audio-volume expander. Connect a suitable d-c milliammeter to the adapter. Turn both the "Phonograph volume" and the "Dynamic amplifier" controls to their extreme counter-clockwise positions. Turn on power switch and allow a few minutes for the instrument to become stabilized. Adjust expander bias control R46, on rear apron of amplifier (see figure 3), to give 1.0 milliampere of plate current with no signal input to the dynamic amplifier.

Loudspeaker

Centering of the loudspeaker voice coil is made in the usual manner with three narrow paper feelers after first removing the front paper dust cover. This may be removed by softening its cement with a very light application of acetone using care not to allow the acetone to flow down into the air gap. The dust cover may be cemented back in place with ambroid upon completion of adjustment.

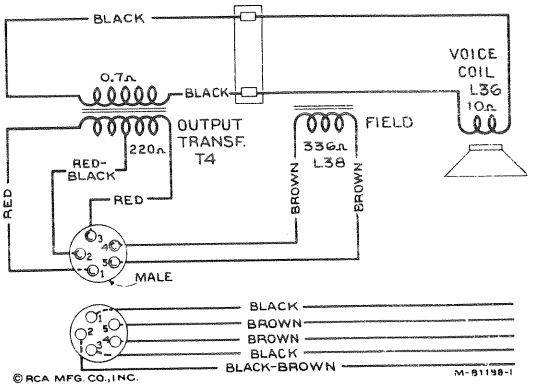


Figure 9—Loudspeaker Wiring

Antenna and Ground Terminals

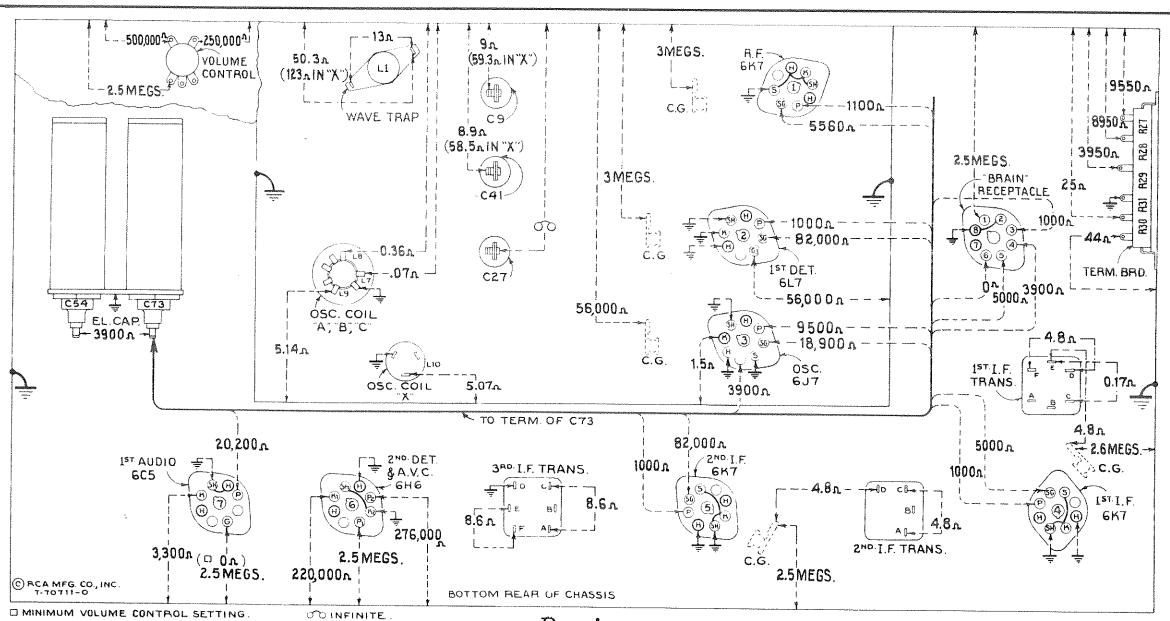
These receivers are equipped with an antenna-ground terminal board having three terminals. These terminals are marked "A2," "A1," and "G," the latter being the ground terminal and should always be connected to a good external ground. The transmission-line leads of the RCA RK-40A antenna system should be connected to terminals "A2" and "A1." The receiver coupling units of the RCA RK-40 and the RCA Spider-Web antenna systems should be connected to terminals "A1" and "G." Connect a single-wire antenna to terminal "A1."

Selector Dial

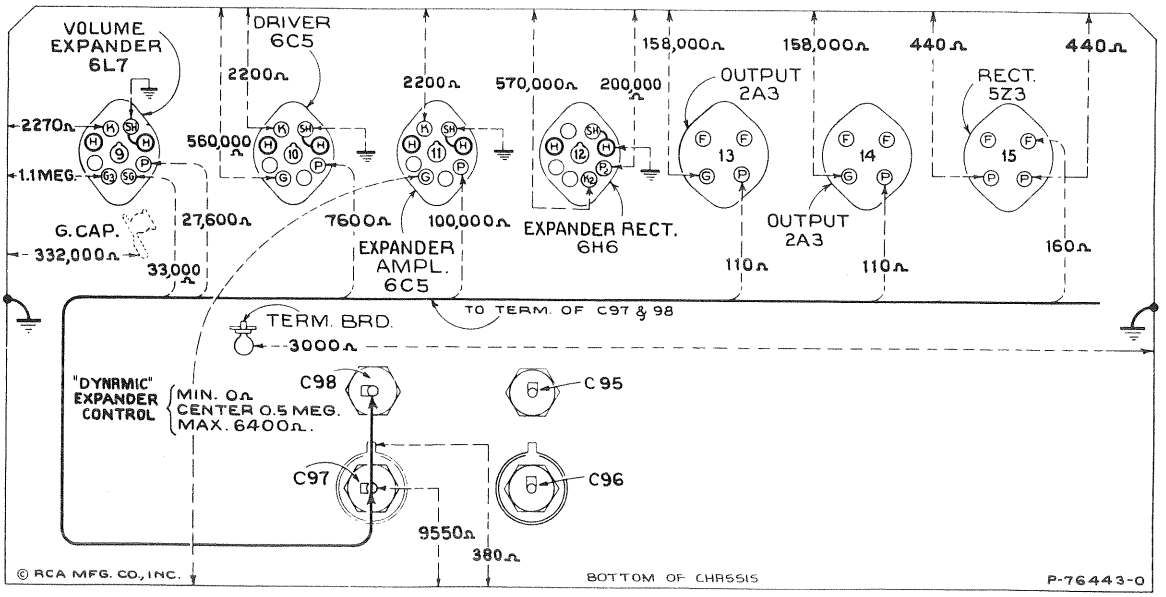
Figure 14 illustrates the relation of the various parts of the dial mechanism when in its "Standard broadcast" position with the range switch likewise turned to its "Standard broadcast" position. In re-assembling the dial after repairs, see that the gears are meshed in accordance with the diagram, at the same time noting that the range switch is in its "Standard broadcast" position and the lever attached to the range-switch shaft placed in the position shown.

To adjust the dial mechanism, set the range switch to its "Standard broadcast" position. Place a straight-edge across the center of the dial so that its edge is even with the lower (end) marking at both the low-frequency and high-frequency ends of the dial. Under such conditions the straight-edge should be parallel with the top of the chassis base. If the straight-edge is not parallel with the top of the chassis base, loosen the nut on the rear of the roller link pivot stud and move the stud up or down until the link roller moves the dial to the desired position so that the end calibration marks obtain the position mentioned above. Tighten the nut on the roller link pivot stud.

Set the gang tuning condenser to its maximum capacity position. Adjust the dial pointer to the low-



Receiver



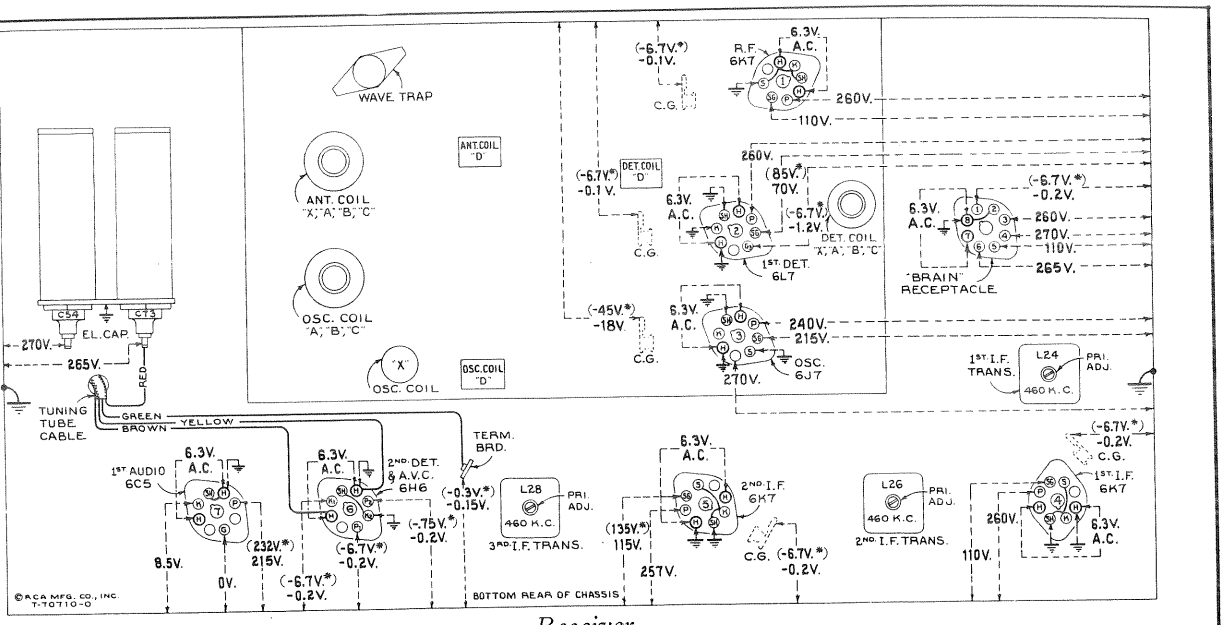
Power Amplifier

Figure 10—Resistance Diagram

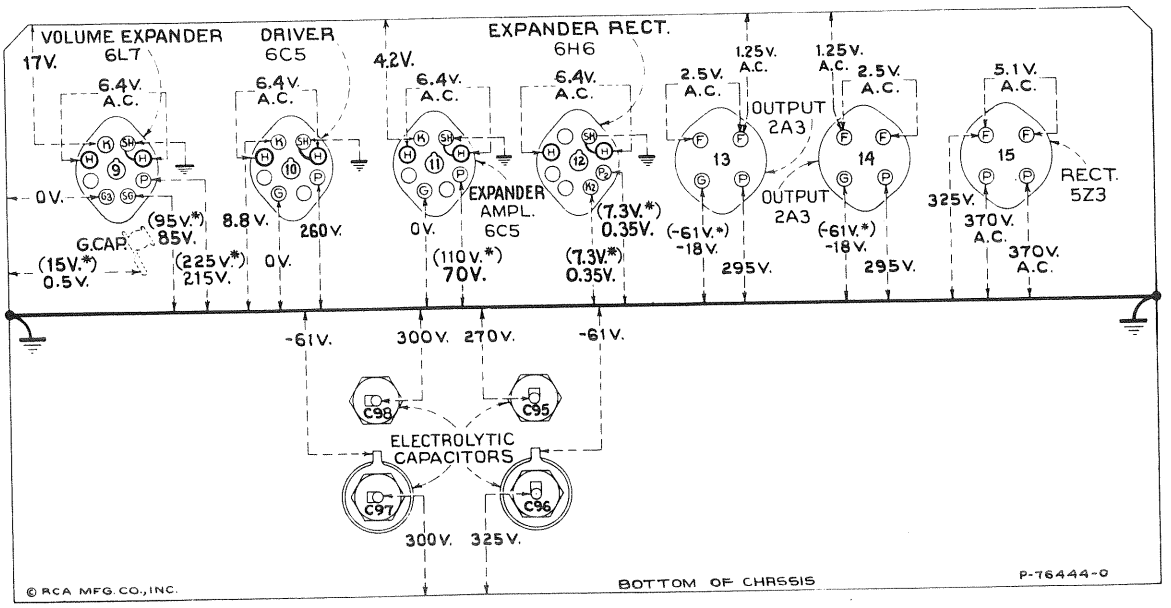
Power supply disconnected—Radiotrons in sockets—All cables connected—Tuning condenser in full-mesh—Range selector in "Standard broadcast" position—Both volume controls maximum—Radio-Phono switch either position

Resistance Measurements

The resistance values shown between Radiotron socket contacts, grid caps, resistors, and terminals to chassis ground or other pertinent point on figure 10, permit a rapid continuity check of the circuits. The use of this diagram in conjunction with the Schematic Circuit Diagram, figure 1, and Wiring Diagrams, figures 2, 4, and 5, will permit the location of certain troubles which might otherwise be difficult to ascertain. Each value as specified should hold within ± 20%. Variations in excess of this limit will usually be indicative of trouble in circuit under test. When measuring the resistance between points of the circuit and ground, it will be necessary to connect the negative terminal of the resistance meter to chassis-ground. If the polarity of the resistance meter is not known, it may be readily ascertained by connecting a d-c voltmeter of indicated polarity across the terminals of the device.



Receiver



Power Amplifier

Figure 11—Radiotron Socket Voltages, Coil, and I-F Trimmer Locations

Measured at 115 volts, 60-cycle supply—Tuned to approximately 1,000 kc—No signal being received—Both volume controls minimum—Radio-Phono switch either position

Radiotron Socket Voltages

Note: Two voltage values are shown for some readings. The value shown in parenthesis with asterisk (*) indicates operating conditions without voltmeter loading. The other value (generally lower) is the actual measured voltage and differs from the value shown in parenthesis because of the additional loading of the voltmeter through the high series circuit resistance.

The voltage values indicated from the Radiotron socket contacts, grid caps, resistors, and terminals to chassis ground on figure 11 will assist in locating cause for faulty operation. Each value as specified should hold within ± 20% when the receiver is normally operative at its rated line voltage. Variations in excess of this limit will usually be indicative of trouble in the basic circuits. To duplicate the conditions under which the voltages were measured requires a 1,000-ohm-per-volt d-c meter, having ranges of 10, 50, 250, 500, and 1,000 volts. Use the nearest range above the specified measured voltage. A-c voltages were measured with a corresponding a-c meter.

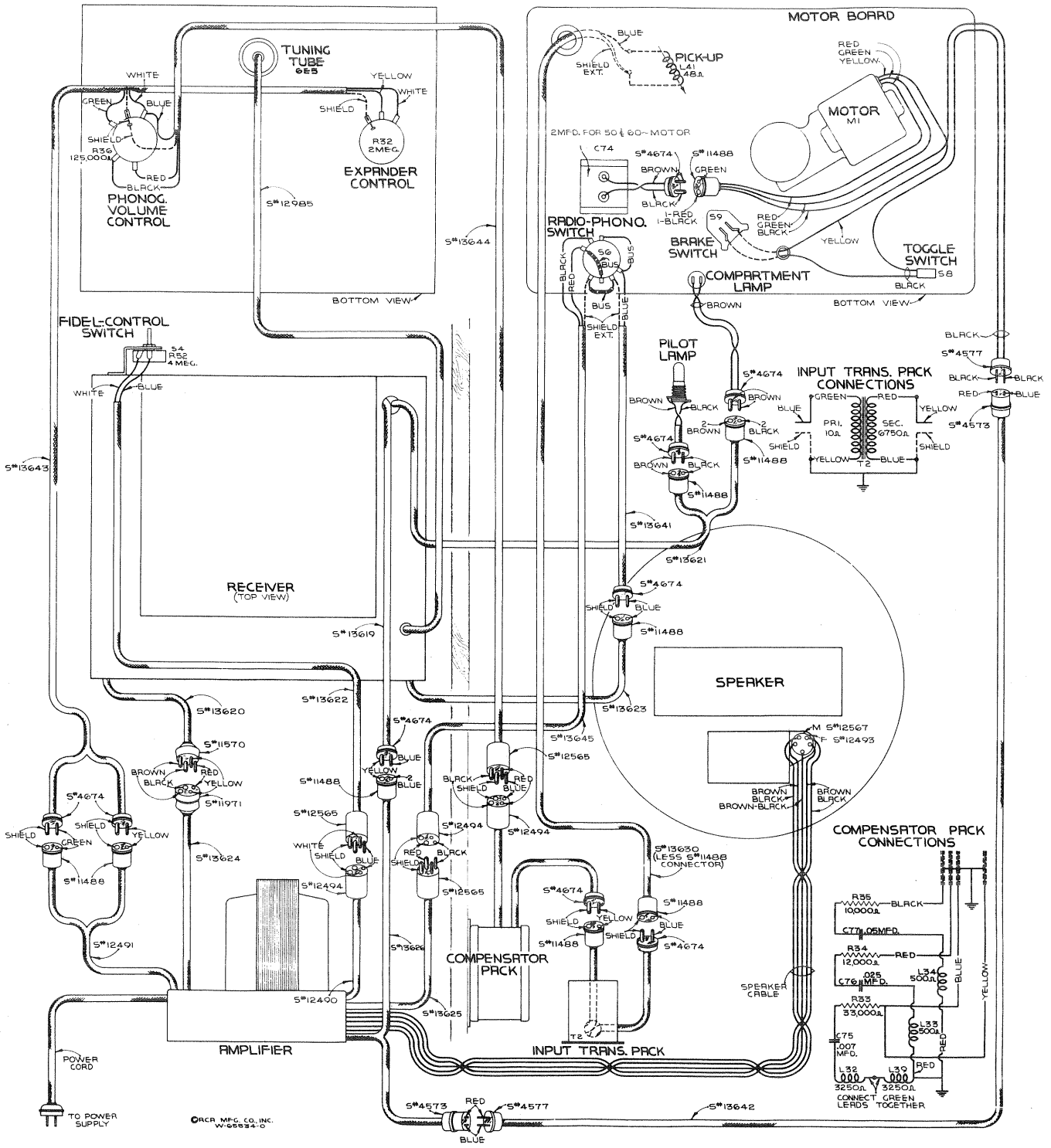


Figure 12—Assembly Wiring

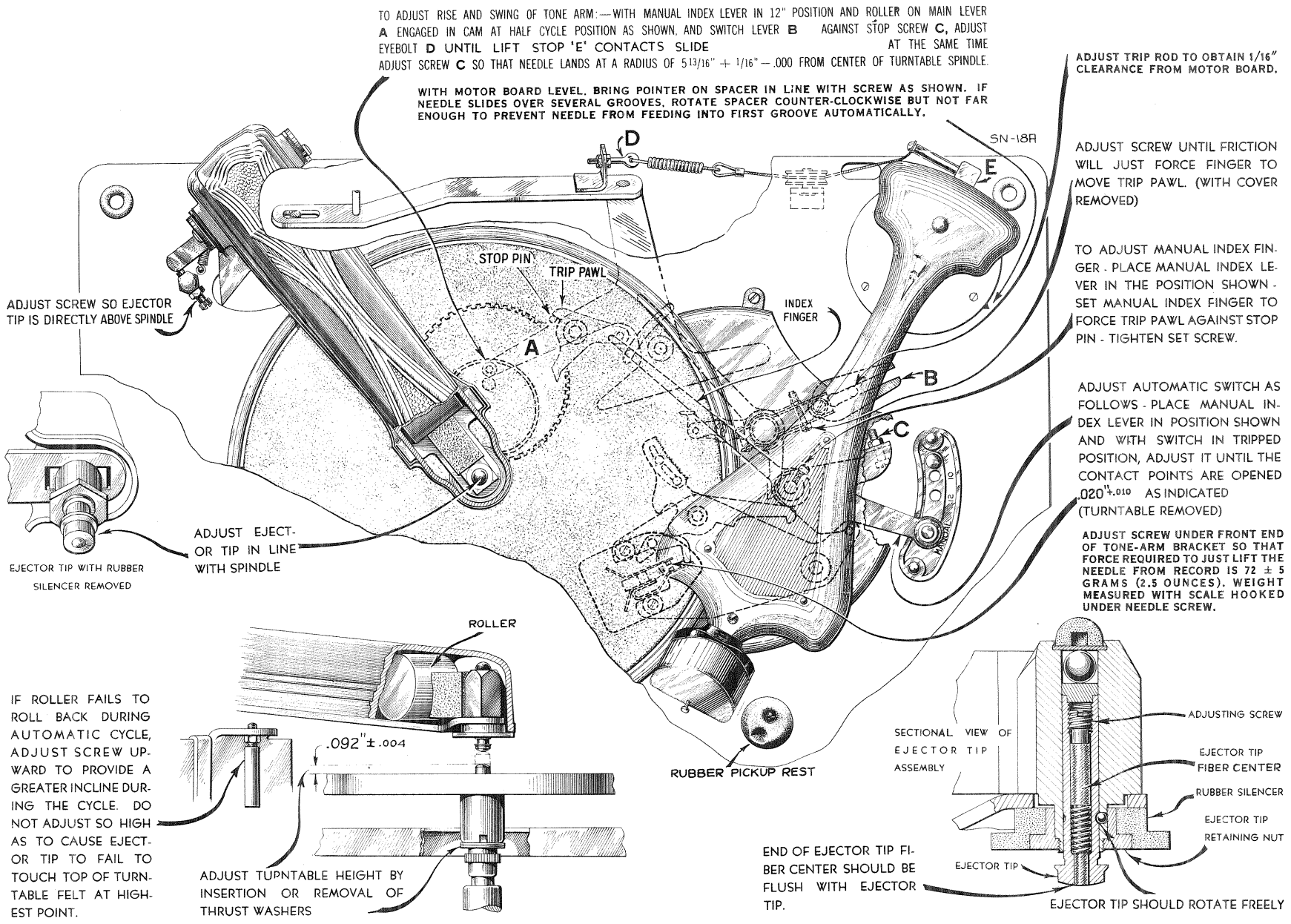


Figure 13—Automatic Record Changer Adjustments

(Lubricate motor bearings with light machine oil)

frequency (end) mark on "Standard broadcast" scale. This is a friction adjustment.

With the gang tuning condenser plates still in full mesh, loosen the two set screws on the vernier-dial hub. Rotate the vernier dial until the "0" marking is in a vertical plane above the center of the shaft. Tighten set screws.

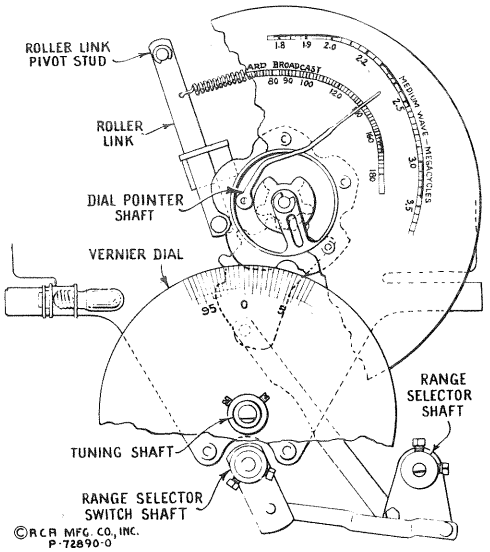


Figure 14—Selector Dial Change Mechanism

Magnetic Pickup

The pickup used in the phonograph unit is of an improved design. The horseshoe magnet is rigidly welded to the pole pieces and is irremovable. There is a centering spring attached to the armature to maintain proper adjustment and to provide a limiting effect on the movement of the armature. The frequency response is substantially uniform over a wide range. Service operations which may be necessary on the pickup are as follows.

Centering Armature

Refer to figure 15 showing the pickup inner structure. The armature is shown in its proper relation to the magnet pole pieces, i.e., exactly centered. Whenever this centering adjustment has been disturbed, the screws A, B, and C should be loosened and the armature clamp adjusted to the point where the vertical axis of the armature is at right angles to the horizontal axis of the pole pieces, and centered between them. This centering operation may be facilitated by inserting a small rod or nail into the armature needle hole, using it as a lever to test the angular movement of the armature. The limitations of the movement in each direction will be caused by the armature striking the pole pieces. The proper adjustment is obtained when there is equal angular displacement of the armature and adjustment rod or nail to each side of the vertical axis of the magnet and coil assembly. The screws A and B should then be secured, observing care not to disturb the adjustment of the armature clamp. Then place the pickup in a vise and secure the centering spring-clamp by means of the screw C, allowing the centering spring to remain in the position at which the armature is exactly centered between the pole pieces. With a little practice, the correct adjustment of the armature may be readily obtained. The air gap between the pole pieces and the armature should be kept free from dust, filings, and other such foreign materials which would obstruct the movement of the pickup armature.

Damping Block

The viscoloid block which is attached to the back end of the armature shank serves as a mechanical filter to eliminate undesirable resonances and to cause the frequency response to be uniform. Should it be necessary to replace this damping block, it may be done by removing screw D and the cover support bracket from the mechanism and taking off the old viscoloid block. The surface of the armature which is in contact with the viscoloid should be thoroughly cleaned with fine emery cloth. Then insert the new block so that it occupies the same position at it did originally. Make certain that the block is in correct vertical alignment with the armature. The hole in the new viscoloid block is somewhat smaller than the diameter of the armature in order to permit a snug fit. With the viscoloid aligned on the armature, screw D and the cover support bracket should then be replaced. Heat should be applied to the armature (viscoloid side) so that the viscoloid block will fuse at the point of contact and become rigidly attached to the armature. A special-tip soldering iron constructed as shown in figure 16 will be found very useful in performing this operation. The iron should be applied only long enough to slightly melt the block and cause a small bulge on both sides.

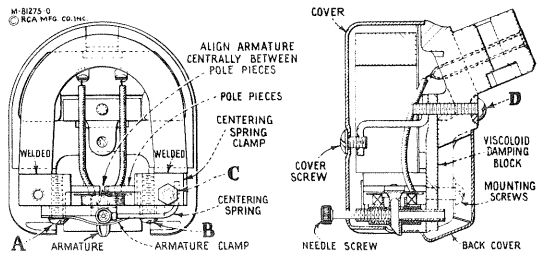


Figure 15—Details of Pickup

Replacing Coil

Whenever there is defective operation due to an open or shorted pickup coil, this coil should be replaced. The method of replacement will be obvious upon inspection of the pickup assembly and by study of the cut-a-way illustrations. Make sure that the new coil is properly centered with the hole in the support strip and glued securely in that position. It is important to re-adjust the armature as previously explained after re-assembly of the mechanism. Only rosin core solder should be used for soldering the coil leads in the pickup. This same type of solder should be used when necessary for soldering the centering spring to the armature.

Magnetizing

Loss of magnetization will not usually occur when the pickup has received normal care because the mag-

net and pole pieces are one unit and the magnetic circuit remains practically closed at all times. When the pickup has been mishandled, subjected to a strong a-c field, jolted, or dropped, there may be an appreciable loss of magnetic strength, in which case it will be necessary to re-magnetize the entire structure. To do this, it will be necessary to first remove the pickup

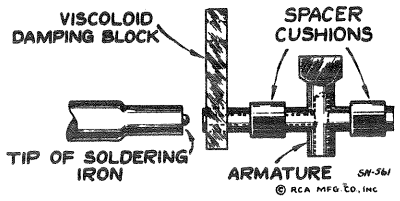


Figure 16—Special Soldering-Iron Tip

mechanism from the tone arm, and then remove the magnet assembly. Place the magnet assembly on the poles of a standard pickup magnetizer such as the **RCA Stock No. 9549 Pickup Magnetizer** and charging the magnet in accordance with the instructions accompanying the magnetizer. It is preferable to check the polarity of the pickup magnet and to re-magnetize it so that the same polarity is maintained.

Automatic Record Ejector

The record changing mechanism is designed to be simple and fool-proof. Under normal operating conditions, service difficulties should be negligible. Occasionally, however, certain adjustments may be required. These adjustments are illustrated and explained in figure 13.

It is important when servicing the automatic mechanism, to have it placed on a level support. It is also important to refrain from forcing the mechanism if there is a tendency to bind or jam, since bent levers and possibly broken parts may result.

The tip of the record ejector is adjustable in relation to the turntable spindle, the two being exactly coaxial when properly adjusted. To align the tip, remove the rubber silencer of the ejector assembly, loosen ejector tip retaining nut and slide the tip assembly to the position where it is in true-line with the axis of the turntable spindle. This adjustment may be simplified by placing several records on the turntable, depressing the spindle through the top record hole and lining up the ejector tip in the spindle hole of the record.

To insure that the ejector tip rotates freely, apply a slight amount of oil to the shank of the tip at the point where it is in contact with the ball bearing.

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers.

Stock No.	Description	List Price	Stock No.	Description	List Price
	RECEIVER ASSEMBLIES		5147	Resistor—3,300 ohms—carbon type, 1 watt (R55)	.22
4427	Bracket—Volume control mounting bracket	$0.18	12312	Resistor—3,300 ohms—insulated, ¼ watt (R25)—Package of 5	1.00
12987	Bracket—Band changeover switch bracket.	.15	5114	Resistor—15,000 ohms—carbon type, 1 watt (R26)	.22
12511	Cap—Grid contact cap—Package of 5	.15	11282	Resistor—56,000 ohms—carbon type, 1/10 watt (R19)—Package of 5	.75
12948	Capacitor—33 Mmfd. (C57)	.20	11365	Resistor—82,000 ohms—carbon type, ¼ watt (R13)—Package of 5	1.00
12629	Capacitor—56 Mmfd. (C62)	.20	11281	Resistor—100,000 ohms—carbon type, 1/10 watt (R11)—Package of 5	.75
12404	Capacitor—120 Mmfd. (C60, C61)	.26	5158	Resistor—220,000 ohms—carbon type, ¼ watt (R54)—Package of 5	1.00
13022	Capacitor—390 Mmfd. (C46, C47, C50, C51)	.25	11398	Resistor—220,000 ohms—carbon type, 1/10 watt (R20)—Package of 5	.75
12898	Capacitor—1500 Mmfd. (C66)	.20	12013	Resistor—1.0 megohm—carbon type, 1/10 watt—located in tuning tube socket (R24)—Package of 5	.75
13608	Capacitor—.0025 Mfd. (C63)	.30	12679	Resistor—2.2 megohm—insulated, ¼ watt (R21)—Package of 5	1.00
4868	Capacitor—.005 Mfd. (C71)	.20	12874	Resistor—3.3 megohm—carbon type, ¼ watt (R22, R23)—Package of 5	1.00
13138	Capacitor—.01 Mfd. (C45, C49, C59, C102)	.25	12870	Scale—Vernier dial scale	.65
4836	Capacitor—.05 Mfd. (C64)	.30	12008	Shield—Intermediate frequency transformer shield	.28
4841	Capacitor—0.1 Mfd. (C52, C99)	.22	12607	Shield—1st or 2nd I.F. transformer shield top	.30
4840	Capacitor—0.25 Mfd. (C53)	.30	12581	Shield—3rd I.F. transformer shield top	.36
13610	Capacitor—8 Mfd. (C72)	1.00	11197	Socket—6-contact 6C5 Radiotron socket	.14
5212	Capacitor—18 Mfd. (C54, C73)	1.16	11198	Socket—7-contact 6K7 or 6H6 Radiotron socket	.15
13611	Capacitor—20 Mfd. (C65)	.85	13095	Socket—Upper left or lower right-hand dial lamp socket	.25
13613	Compensator Pack—Comprising two .015 Mfd., one .05 Mfd. capacitors and one 27,000 ohms, one 22,000 ohms, one 12,000 ohms resistors (C55, C56, C58, R15, R16, R17)	1.20	11222	Socket—Upper right or lower left-hand dial lamp socket	.18
12006	Core—Core and stud assembly for intermediate frequency transformers	.22	11381	Socket—Tuning tube socket and cover	.45
13612	Filter Pack—Comprising two .453 Henry Chokes, two 560 Mmfd., one 1,000 Mmfd. and one 2,200 Mmfd. capacitors (L30, L31, C67, C68, C69, C70)	2.95	11196	Socket—8-contact R.F. unit voltage supply socket	.15
12866	Foot—Chassis foot assembly—Package of 2	.75	12007	Spring—Retaining spring for core in I.F. transformer—Package of 10	.36
4340	Lamp—Pilot lamp—Package of 5	.60	12986	Stud—Band indicator operating arm stud—Package of 5	.65
12868	Link—Link mechanism on band indicator operating arm	.45			
13609	Resistor—Voltage divider—Comprising one 600 ohms, one 5,000 ohms, one 3,950 ohms, one 25 ohms and one 19 ohms sections (R27, R28, R29, R30, R31)	.95			
12311	Resistor—1,000 ohms—insulated, ¼ watt (R12)—Package of 5	1.00			
5112	Resistor—1,000 ohms—carbon type, ¼ watt (R10, R14)—Package of 5	1.00			

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REPLACEMENT PARTS—Continued

Stock No.	Description	List Price
12860	Switch — Low frequency tone and power switch (S5, S7)	1.50
12988	Switch—Bias switch (S10)	.65
13616	Tone control — High frequency tone and fidelity control (R52, S4)	1.40
12981	Transformer—First intermediate frequency transformer (L24, L25, L40, C46, C47)	2.15
12990	Transformer — Second intermediate frequency transformer (L26, L27, C50, C51)	1.85
12982	Transformer—Third intermediate frequency transformer (L28, L29, C60, C61, C62, R19, R20)	2.25
12861	Volume Control (R18)	1.00
	MAGIC BRAIN UNIT ASSEMBLIES	
12806	Board — 3-contact antenna and ground terminal board	.25
5237	Bushing — Variable condenser mounting bushing assembly—Package of 3	.43
12886	Cable — Shielded power cable, approximately 4 inches long, complete with 8-contact male plug	1.50
12511	Cap—Grid contact cap—Package of 5	.15
12714	Capacitor—Adjustable trimmer capacitor (C3, C4, C5, C6, C14, C16)	.38
12884	Capacitor—Adjustable trimmer capacitor (C10, C18, C23, C38, C39)	.40
12807	Capacitor—Adjustable trimmer capacitor (C13, C35, C36, C37)	.35
12896	Capacitor—15 Mmfd. (C34)	.20
12722	Capacitor—18 Mmfd. (C15)	.20
12891	Capacitor—36 Mmfd. (C40)	.20
12629	Capacitor—56 Mmfd. (C24)	.20
12895	Capacitor—56 Mmfd. (C17)	.20
12723	Capacitor—56 Mmfd. (C2, C44)	.20
13307	Capacitor—62 Mmfd. (C11)	.20
12724	Capacitor—120 Mmfd. (C25, C28, C29)	.28
12725	Capacitor—150 Mmfd. (C1)	.28
12894	Capacitor—180 Mmfd. (C22)	.20
12727	Capacitor—555 Mmfd. (C21)	.20
12537	Capacitor—560 Mmfd. (C7, C26, C33, C42)	.20
12898	Capacitor—1,500 Mmfd. (C12)	.20
12729	Capacitor—1,550 Mmfd. (C20)	.26
12728	Capacitor—4,500 Mmfd. (C19)	.36
12897	Capacitor—4,700 Mmfd. (C43)	.40
4858	Capacitor—.01 Mfd. (C8, C30, C31, C32)	.25
12879	Coil—Antenna coil and shield, XABC bands (L2, L3, L4, L5, L6)	1.90
12888	Coil—Antenna coil, "D" band (L13, L14)	.60
12880	Coil—Detector coil and shield, XABC bands (L15, L16, L17, L18, L19, L20)	2.05
12709	Coil—Oscillator coil and shield, ABC bands (L7, L8, L9)	2.02
12881	Coil—Oscillator coil and shield, X band only (L10)	.80
12890	Coil—Oscillator coil, "D" band (L11, L12, L23)	.70
12889	Coil—R.F. coil, "D" band (L21, L22)	.65
12877	Condenser—3-gang variable tuning condenser (C9, C27, C41)	5.10
12887	Connector—8-contact male connector and cover for power cable, Stock No. 12886	.40
12664	Core—Adjustable core and stud for Stock No. 12654	.22
12800	Core—Adjustable core and stud for Stock No. 12709	.20
12882	Core—Adjustable core and stud for Stock No. 12881	.20
11324	Resistor—560 ohms—carbon type, ¼ watt (R2)—Package of 5	1.00
5112	Resistor—1,000 ohms—carbon type, ¼ watt (R3)—Package of 5	1.00
11298	Resistor—5,600 ohms—carbon type, 1 watt (R6)	.22
3998	Resistor—15,000 ohms—carbon type, ¼ watt (R5)—Package of 5	1.00
11282	Resistor—56,000 ohms—carbon type, 1/10 watt (R4, R9)—Package of 5	.75
8064	Resistor—82,000 ohms—carbon type, ½ watt (R8)—Package of 5	1.00
11397	Resistor — 560,000 ohms — carbon type, 1/10 watt (R1, R7)—Package of 5	.75
12651	Shield—Coil shield for Stock Nos. 12879, 12880	.22
12710	Shield—Coil shield for Stock No. 12709.	.28
12883	Shield—Coil shield for Stock No. 12881.	.20
11198	Socket—7-contact 6K7 Radiotron socket	.15
11279	Socket—7-contact 6L7 Radiotron socket	.20
12885	Socket—8-contact 6J7 Radiotron socket	.20
12007	Spring—Retaining spring for core, Stock Nos. 12664, 12800, 12882 — Package of 10	.36
12878	Switch — Range switch and mounting nut (S1, S2, S3)	3.60
12654	Trap—Wave-trap, complete (L1)	.75
	DRIVE ASSEMBLIES	
10705	Ball—5/32-inch diameter steel ball for planetary drive—Package of 20	.25
10941	Ball—⅛-inch diameter steel ball for planetary drive bearing—Package of 20	.25
12904	Bushing—Plate and bushing assembly for planetary drive mounting	.20
12905	Coupling—Flexible coupling and shaft assembly, complete	.50
12909	Dial—Band indicating dial and cam assembly	1.05
12899	Drive—Variable tuning condenser drive, complete, including mounting bracket drive, dial scale and indicator, less vernier dial, Stock No. 12870 and link, Stock No. 12868	4.40
12906	Gear—Anti-lash drive gear, complete	.75
12910	Gear—Sector gear and link assembly for band selector	.20
12908	Indicator—Station selector indicator pointer	.20
8051	Link—Link and roller assembly, complete with spring	.30
12911	Screen—Dial lamp screen and light diffuser	.20
4669	Screw—Set screw for flexible coupling or gear, Stock Nos. 12905 and 12906 — Package of 10	.25
12901	Shaft—Direct drive shaft and pinion gear for planetary drive	.75
12900	Shaft—Vernier drive shaft for planetary drive	.25
12903	Spring — Tension spring for planetary drive bearing—Package of 10	.20
12907	Spring—Tension spring for gear, Stock No. 12906—Package of 10	.20
8052	Spring—Tension spring for link, Stock No. 8051—Package of 5	.32
	AMPLIFIER ASSEMBLIES	
12511	Cap—Grid contact cap—Package of 5	.15
12110	Cap—Top shield cap for 6L7 Radiotron	.14
12488	Capacitor—270 Mmfd. (C90, C91)	.14
5107	Capacitor—.0025 Mfd. (C88)	.16
4838	Capacitor—.005 Mfd. (C93, C94)	.20
4868	Capacitor—.005 Mfd. (C92)	.20
5196	Capacitor—.035 Mfd. (C79)	.18
4886	Capacitor—.05 Mfd. (C85)	.20
4518	Capacitor—.05 Mfd. (C81)	.52
4839	Capacitor—0.1 Mfd. (C89, C100)	.52
5170	Capacitor—.25 Mfd. (C87)	.25
4840	Capacitor—.25 Mfd. (C101)	.30
11240	Capacitor—10 Mfd. (C97)	1.08
12472	Capacitor—10 Mfd. (C86)	1.00
5212	Capacitor—18 Mfd. (C84, C95)	1.16
11496	Capacitor—18 Mfd. (C98)	1.15
12470	Capacitor—20 Mfd. (C83)	1.10
12467	Capacitor—30 Mfd. (C96)	1.40
12465	Capacitor—Capacitor pack, comprising 3 sections, each 0.5 Mfd. (C78, C80, C82)	1.50
11272	Clamp—Volume control or speaker cable clamp	.10
5240	Cover—Fuse cover	.24
12468	Expander—Control (R46)	1.00
10907	Fuse—3-ampere fuse (F1)—Package of 5.	.40
5239	Mounting—Fuse mounting	.36
12471	Plate—6L7 socket mounting plate assembly, less socket	.15
12466	Reactor—Filter reactor (L37)	2.35
13454	Resistor—270 ohms—insulated, ¼ watt (R39)—Package of 5	1.00
12195	Resistor—2,200 ohms—insulated, ¼ watt (R41, R50)—Package of 5	1.00
11298	Resistor—5,600 ohms—carbon type, 1 watt (R47)	.22
11332	Resistor—22,000 ohms—carbon type, 1 watt (R48)—Package of 5	1.10
12487	Resistor—33,000 ohms—carbon type, 2 watt (R40)	.25

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Stock No.	Description	List Price
12286	Resistor—56,000 ohms—insulated, 1/4 watt (R53)—Package of 5	1.00
12263	Resistor—100,000 ohms—insulated, 1/4 watt (R42, R43, R45, R51)—Package of 5	1.00
12452	Resistor—330,000 ohms—insulated, 1/4 watt (R37)—Package of 5	1.00
12285	Resistor—470,000 ohms—insulated, 1/4 watt (R44)—Package of 5	1.00
12486	Resistor—560,000 ohms—insulated, 1/4 watt (R38, R49)—Package of 5	1.00
4794	Socket—4-contact 5Z3 or 2A3 Radiotron socket	.15
11197	Socket—6-contact 6C5 Radiotron socket	.14
11198	Socket—7-contact 6H6 or 6L7 Radiotron socket	.15
12464	Transformer — Interstage transformer (T3, L35)	5.95
12463	Transformer—Power transformer, 105-125 volt, 50-60 cycle (T1)	8.58
	EJECT ARM ASSEMBLIES	
11541	Arm—Eject arm, complete	8.15
11533	Ball—1/16-inch diameter steel ball—Package of 10	.20
10129	Ball—3/16-inch diameter steel ball—Package of 20	.25
11529	Bearing—Ejector tip bearing and nut	.32
11538	Bracket—Eject arm bracket	1.72
11537	Collar—Eject arm shaft collar and set screw	.24
11540	Cover—Eject arm cover	1.52
11536	Cushion—Counter balance roller cushion located inside of eject arm	.14
4055	Post—Vertical adjustment post — located on eject arm bracket	.30
3729	Roller—Eject arm counter balance roller —located inside of eject arm	.45
4580	Screw—No. 6—32-3/16-inch square head set screw for eject arm collar — Package of 10	.25
11534	Screw—No. 8—36-7/32-inch special screw for eject arm tip center adjustment—Package of 10	.14
11535	Shaft and Collar—Eject arm vertical action shaft and collar assembly	.15
11528	Silencer—Ejector tip silencer	.14
4067	Spring — Ejector arm bracket spring — Package of 10	.30
11531	Spring—Ejector tip spring—Package of 10	.42
11530	Tip—Ejector tip with tip center, adjusting screw and cap	.32
11539	Yoke—Eject arm yoke assembly	.94
	PICKUP AND ARM ASSEMBLIES	
13627	Arm—Pickup arm, complete less pickup unit	8.45
11548	Back—Pickup back	.52
10941	Ball—Pickup arm pivot shaft ball bearing—Package of 20	.25
12543	Bracket — Pickup arm spring, adjusting bracket and screw	.12
13629	Cable—Pickup arm operating cable—Package of 5	1.20
12541	Coil—Pickup coil (L41)	.64
13630	Connector—Shielded pickup cable and connector assembly — approximately 43 inches long—less female connector	.45
11545	Cover—Pickup front cover	.22
11546	Cover—Pickup back cover with mounting screws	.14
12850	Damper—Damper assembly for pickup arm base—comprising one upper damper and bushing, one lower bushing and one lower bearing	.25
11723	Escutcheon—Pickup arm escutcheon	.62
14115	Mechanism—Comprising one armature and spring assembly, one armature clamp and one damper	1.35
13628	Pickup—Pickup unit, complete	7.00
12546	Plug—Pivot shaft bearing plug—Package of 2	.14
13631	Rod—Pickup arm trip rod and nut—Package of 5	.30
11549	Screw—Pickup front cover screw—Package of 10	.42
3387	Screw—Nut and washer for mounting pick-up to arm—Package of 10	.50
12539	Screw—Pickup needle screw—Package of 10	.20
12544	Spring — Pickup arm adjusting spring — Package of 10	.25
	OPERATING MECHANISM	
13632	Cam—Cam and gear assembly	2.60
6808	Clutch—Trip lever friction clutch	.30
11558	Cover—Metal cover for trip lever and friction finger assembly	.36
6809	Finger—Manual index lever finger assembly	.25
3670	Finger—Friction finger assembly	.32
11554	Lever—Manual index lever—less pin	.62
13633	Lever—Main lever and link assembly	1.75
11557	Lever—Main spring lever	.42
11555	Lever—Trip lever and friction clutch assembly	.94
6503	Pawl—Trip pawl assembly	.40
3672	Pin—Manual index lever pin	.42
13635	Plate—Eject arm actuating plate assembly	.75
4564	Screw—Manual index lever finger set screw Package of 10	.20
4059	Screw—Trip lever clutch tension adjustment screw—Package of 10	.22
4566	Screw—Special screw used to fasten main lever and link assembly bushing—Package of 10	.30
13637	Spacer—Pickup arm mounting spacer	.60
13638	Spring—Actuating spring—Package of 10	.40
4565	Spring—Manual index lever finger tension spring—Package of 10	.30
4061	Spring—Main spring lever tension spring—Package of 10	.38
2893	Spring—Trip lever latch plate tension—Package of 10	.30
13634	Spring—Pickup arm cable tension spring—Package of 10	.35
3676	Spring—Cam and gear pawl tension spring —Package of 10	.52
13639	Spring—Cam and gear arm tension spring —Package of 10	.40
4125	Spring—Eject arm horizontal action tension spring—Package of 10	.42
13636	Stud—Pickup arm lift cable stud and nut—Package of 10	.40
2917	Washer—Spring washer—"U" type—Package of 10	.25
	MOTOR ASSEMBLIES	
9735	Motor—105-125 volts—25 cycles (M1)	49.50
9651	Motor—105-125 volts—50 cycles (M1)	35.35
9650	Motor—105-125 volts—60 cycles (M1)	35.35
12050	Suspension Spring — Motor mounting spring, washer, and stud assembly — Comprising six springs, six cup washers, three spring washers and three studs	.60
	AUTOMATIC SWITCH ASSEMBLIES	
3994	Cover—Motor switch cover	.26
10184	Plate — Automatic brake latch plate — Package of 5	.40
10174	Springs—Automatic brake springs—Package of 2 sets	.50
6805	Switch Assembly—Automatic switch, complete	1.90
3322	Switch—Motor switch (S9)	.75
	MOTOR BOARD ASSEMBLIES	
11881	Base — Phonograph compartment lamp socket and base	.55
12051	Capacitor—2 Mfd., complete with 2-contact male connector for use with motor, Stock No. 9650 or No. 9651 only (C74)	4.18
13101	Capacitor—4 Mfd., complete with 2-contact male connector for use with motor, Stock No. 9735 only (C74)	5.05
4674	Connector—2-contact male connector for Stock Nos. 12051, 13101 or phono compartment lamp leads	.25
4577	Connector—2-contact male connector for motor cable	.30
11488	Connector—2-contact female connector for motor leads	.14
11542	Cover—Turntable cover	.88
11553	Escutcheon — Index escutcheon engraved "Manual—12—10"	.44
4340	Lamp—Phonograph compartment lamp—6.3 volts—Package of 5	.60

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Stock No.	Description	List Price
3764	Nut—Cap nut for motor board suspension assembly—Package of 4	.40
11551	Rest—Pickup rest	.14
3654	Roller—Pickup arm cable guide roller—Comprising bracket, roller and guide pin	.34
11711	Shade—Phonograph compartment lamp shade	.16
3763	Suspension Spring—Suspension spring, washer and bolt assembly for motor board—Comprising one bolt, two cup washers, two springs, two "C" washers and one cap nut	.42
4671	Switch—Operating switch—toggle type (S8)	.72
11599	Turntable—Complete	2.90
	REPRODUCER ASSEMBLIES	
13614	Coil—Field coil and magnet assembly (L38)	13.20
12474	Cone—Reproducer cone (L36)	1.35
12567	Plug—5-contact male reproducer plug	.22
9767	Reproducer—Complete	21.75
12568	Transformer—Output transformer (T4)	3.30
	MISCELLANEOUS CABLES AND PLUGS	
13644	Cable—3-conductor shielded compensation cable, approximately 33" long, complete with 4-contact male connector—connects compensator pack to phonograph volume control	2.20
12991	Cable—3-conductor shielded fidelity control cable, approximately 7¼" long—connects fidelity control to receiver	.50
13645	Cable—2-conductor shielded grid switching cable, approximately 18" long, complete with 4-contact female connector—connects radio-record switch to amplifier	1.25
13625	Cable—Shielded input cable, approximately 14" long, complete with 4-contact male connector—connects amplifier to radio-record switch	.50
13621	Cable—2-conductor pilot and compartment lamp cable, approximately 13" long, complete with two 2-contact female connectors	1.00
13626	Cable—3-conductor motor and power switch cable, approximately 7½" long, complete with two female connectors—connects amplifier to phonograph motor and receiver power switch	1.65
13642	Cable—2-conductor motor power cable, approximately 35" long, complete with one 2-contact male and one 2-contact female connectors—connects cable stock No. 13626 to motor leads	1.90
13623	Cable—Single conductor shielded output cable, approximately 5" long, complete with 2-contact female connector—connects receiver to radio-record switch	.55
13641	Cable—Single conductor shielded output cable, approximately 10½" long, complete with 2-contact male connector—connects radio-record switch to radio receiver	.60
13620	Cable—4-conductor plate and filament supply cable, approximately 9" long, complete with 4-contact male connector—connects receiver to amplifier power supply	1.05
13619	Cable—2-conductor power cable, approximately 27" long, complete with 2-contact male connector—connects power switch to amplifier	.60
13624	Cable—4-conductor plate and filament supply cable, approximately 6" long, complete with 4-contact female connector—connects amplifier power supply to receiver	1.25
13622	Cable—2-conductor shielded tone control cable, approximately 28" long, complete with 4-contact male connector—connects receiver tone control to amplifier	.75
12490	Cable—2-conductor shielded tone control cable, approximately 10" long, complete with female connector—connects amplifier to receiver tone control	.58
12985	Cable—Tuning lamp cable and socket	1.70
12491	Cable—2-conductor shielded volume control cable, approximately 7½" long, complete with 2 female connectors—connects amplifier to phonograph volume control and expander control	.68
13643	Cable—2-conductor shielded volume control cable, approximately 37½" long, complete with two 2-contact male connectors—connects phonograph volume control and expander control to amplifier	2.00
4674	Connector—2-contact male connector for cable stock Nos. 13619, 13641, 13643, pilot lamp socket leads, compensator pack or input transformer cables	.25
11488	Connector—2-contact female connector for cable stock Nos. 12491, 13621, 13623, 13626 or input transformer cable	.14
4577	Connector—2-contact male connector for cable stock No. 13642	.30
12565	Connector—4-contact male connector for cable stock Nos. 13622, 13625 or 13644	.20
4573	Connector—2-contact female connector with oblong openings for cable stock Nos. 13626 or 13642	.30
12493	Connector—Speaker cable 5-contact female connector	.20
12494	Connector—4-contact female connector for cable stock Nos. 12490, 13645 or compensator pack cable	.18
11570	Connector—4-contact male connector for cable stock No. 13620	.32
11971	Connector—4-contact female connector for cable stock No. 13624	.55
	MISCELLANEOUS ASSEMBLIES	
5211	Bolt—Speaker mounting bolt assembly—Package of 2	.24
4391	Box—Used needle box	.70
13615	Bracket—Tuning lamp mounting bracket and clamp	.25
13103	Cap—Pilot lamp cap and bull's-eye—Package of 5	.65
12560	Compensator Pack—Phonograph compensator pack complete with two shielded cables and connectors (L32, L33, L34, L39, C75, C76, C77, R33, R34, R35)	3.74
12915	Crystal—Station selector escutcheon and crystal	1.30
11580	Cover—Pilot lamp cover	.12
12742	Escutcheon—Tuning lamp escutcheon	.22
12552	Expander Control (R32)	1.06
4340	Lamp—Pilot lamp—6.3 volts—Package of 5	.60
12699	Knob—Large station selector knob—Package of 5	.68
12700	Knob—Small vernier station selector knob—Package of 5	.58
11347	Knob—Low frequency tone control and power switch, radio-record switch, radio volume control, range switch, or high frequency tone control knob—Package of 5	.75
11582	Knob—Phonograph volume control or expander control knob—Package of 5	.50
11607	Receptacle—Needle card holder	.38
11829	Roller—Record pocket slide roller—Package of 2	.55
4560	Screw—Chassis mounting screw assembly (front)—Comprising one screw, one washer and one lock washer—Package of 10	.30
13102	Screw—Chassis mounting screw assembly (bottom)—Comprising one screw, two cushions, one spacer, one washer and one lock washer—Package of 2	.30
11573	Socket—Pilot lamp socket	.28
11349	Spring—Retaining spring for knob, Stock Nos. 11347, 11582 and 12700—Package of 5	.25
4982	Spring—Retaining spring for knob, Stock No. 12699—Package of 10	.50
12824	Switch—Radio-record switch (S6)	1.00
12555	Transformer—Phonograph input transformer (T2)	6.00
7217	Transformer—Step-down transformer for 220 volts, 50-60 cycle operation	17.40
12554	Volume Control—Phonograph volume control (R36)	1.52

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First Edition